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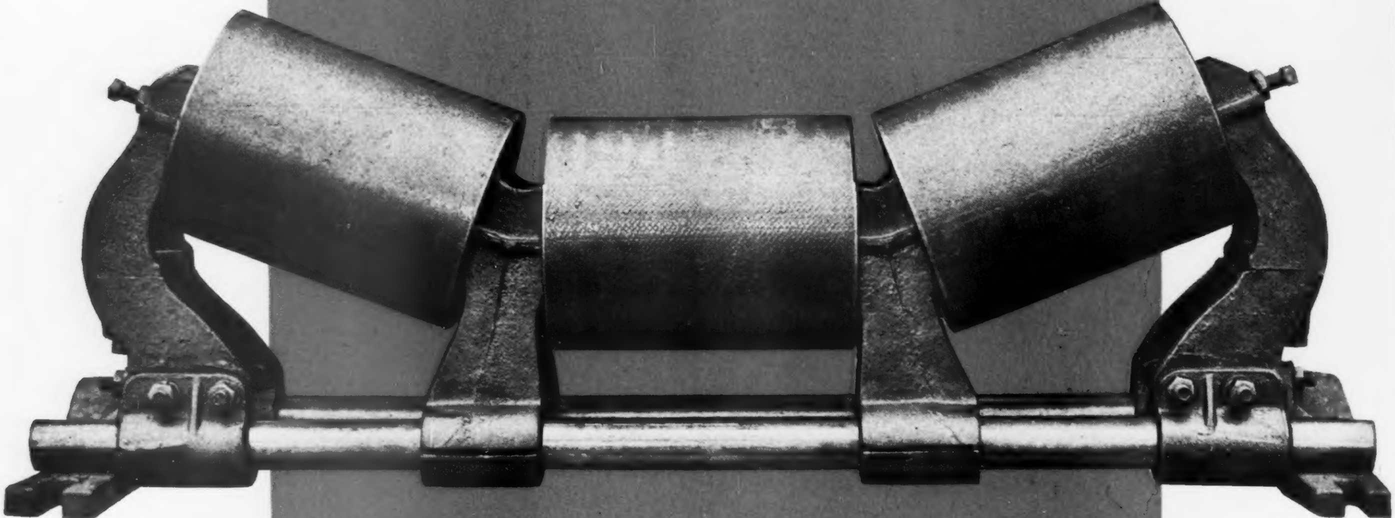

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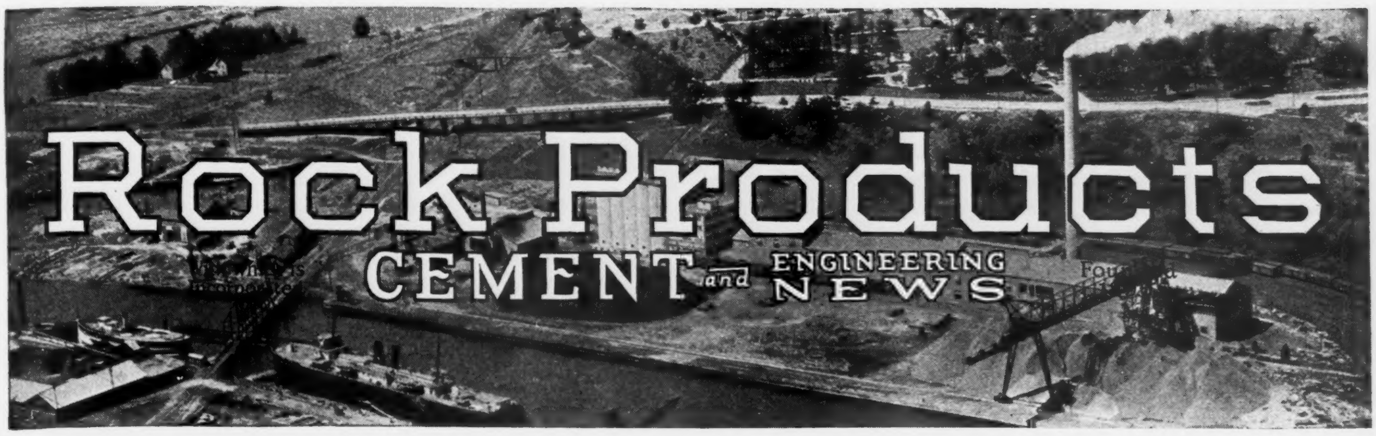


Volume XXVIII | Chicago, May 30, 1925 | Number 11

Manor Plant of the Charles Warner Company Near Tullytown, Penn.

Designed and Built to Insure 24-Hour Running with a Capacity of 6C0 Tons Per Hour and for Winter as Well as Summer Operation

THE Manor plant of the Charles Warner Co. (Wilmington, Del.) is perhaps the best constructed sand and gravel plant that has been built. It was erected to serve a deposit that will not be exhausted by the end of the next generation, a matter that has been determined by propecting with bore holes and by large scale working. It represents a heavy capital investment but this is quite justified by the life of the deposit and the continuous day and night system of working employed, which leaves no time for the changes, additions and repairs to which the ordinary type of plant is subject at occasional intervals. Lost time is expensive when a plant is producing 600 tons an hour.

The plant is about five miles from Trenton, N. J., near Tullytown, Penn., on the opposite side of the Delaware river from Trenton. All shipments are made by water, to Philadelphia, Wilmington and the other busy cities which line the shores of that historic stream. The Charles Warner Co. ships a great deal of sand and gravel from this district by rail, but it ships it from the Penn plant, which it recently acquired,

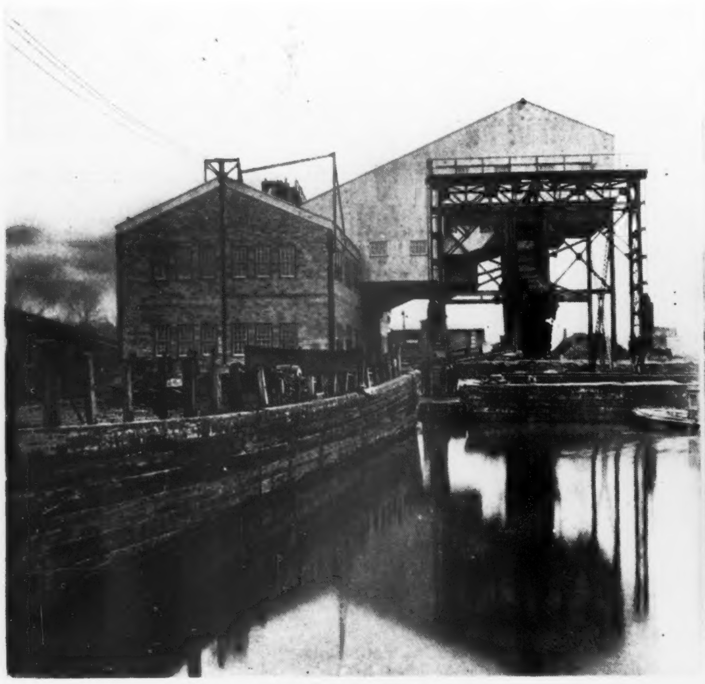
Manor sand and gravel plant of the Charles Warner Co. near Tullytown, Penn. It is on the Delaware river about five miles from Trenton, N. J.

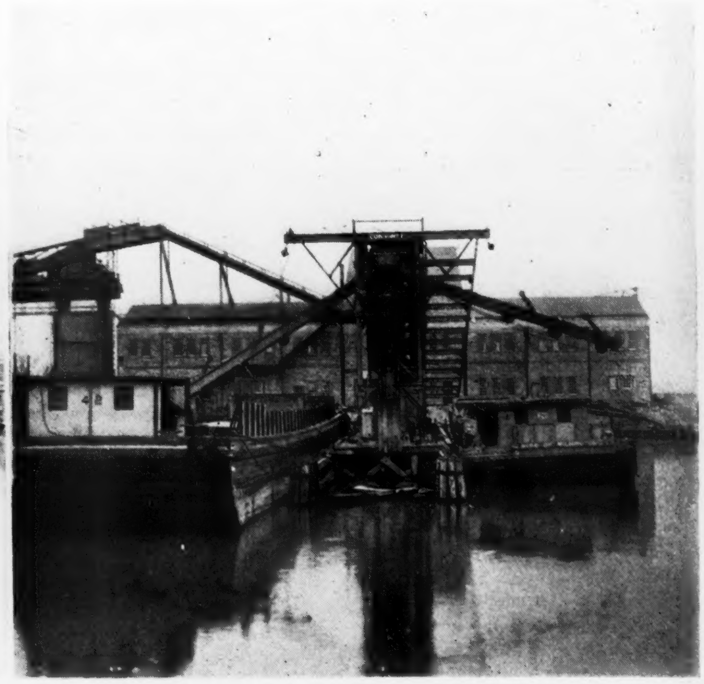
about 3½ miles from the Manor plant.

The way in which the Manor plant came to be built is an interesting example of present day developments in the sand and gravel industry. For many years the company had been a large producer of sand and gravel, dredging it from the bed of the Delaware river. It was thought at one time that these deposits were "inexhaustible," but only a few years ago it developed that there was serious danger of their exhaustion and that it would be necessary to look elsewhere for a future supply. Search discovered the Manor deposit.

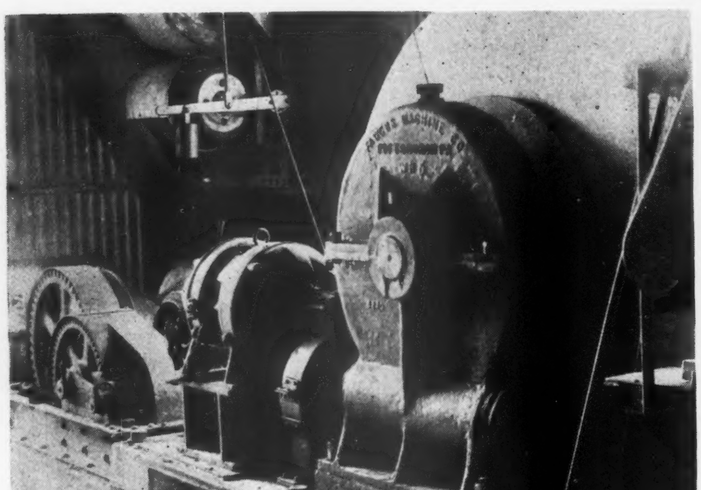
This deposit fronts on the river so that it was possible to test it, and also to get quick action in working it in a commercial way, in an unusual manner. The *Jackson,* one of the company's river dredges, dug herself a basin in the bank of the river and was moored there to serve as a washing and screening plant. A dragline excavator was purchased from the Dravo Construction Co. of Pittsburgh, standard gage track was laid to a point in front of the dredge and cars and locomotives installed. The system of working adopted was to dig the material with the dragline, transport it to the dredge by hopper bottom cars and dump it into the water where the dredge could reach it with its bucket line. This system intended at first to be a temporary thing has proven very successful and is still in operation. The production of the dredge was increased greatly beyond what it had been able to produce while working in the river and the washing was very thorough. As an important byproduct of this installation the information was gained from which the type and size of the present plant was determined when the time came to build it.

The Manor plant was designed by the engineering department of the Charles Warner Co., the washing and screening and conveying equipment being furnished by the Link Belt Co. In appearance it does not at all resemble the ordinary sand and gravel plant. The long and high building of steel frame, with curtain walls of hollow tile, looks as though it might have house a cement plant or some sort of a factory. Within one finds scrubbers, screens and crushers as in any sand and gravel plant, but these are very solidly installed. All the





Left—End of plant showing the bridge supporting the line of buckets which unload barges. Right—End of conveyors which load barges on the river



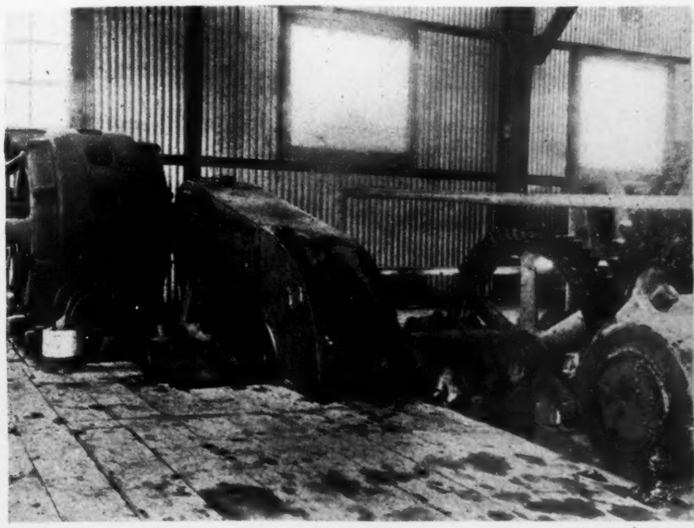
Left—Hoist on the dredge. A similar machine handles the bucket line for unloading barges. Right—The buckets unloading a barge at the plant

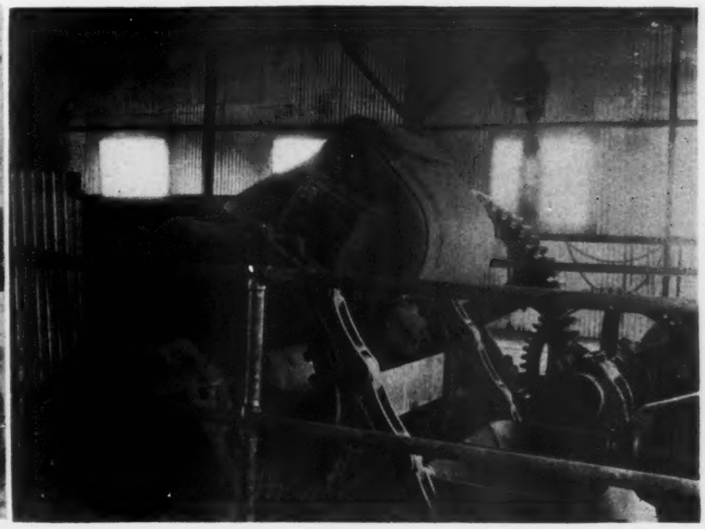
floors are of concrete and all the machines that might offer any danger to the passer-by are protected with rails or piping. The stairs have steel stringers and cast iron treads. There is ample room everywhere to work and apparently provision has been made for installing additional machines to double the output. There is abundant light from the long rows of windows on both sides of the building, and as it is heated in winter the men can work as comfortably then as in the summer. The office is a large handsome room well equipped with desks and a drawing table and filing cabinets. At one end of the building is a large machine shop with sufficient equipment to make any ordinary repairs. It is intended to install a fully equipped laboratory for making the regular sizing tests and also for testing the value of the plant product for concrete aggregate and other purposes.

The material which is washed and screened in this plant is dug from the deposit by the dredge *John W. Betelle*. This was named after the man who has been longest in the service of the Charles Warner Co., a period of 54 years. Capt. Betelle is 78 years of age and is stronger and more active than many a man in his fifties. Until the Manor plant was put into production he had charge of a crushing plant at Wilmington to which the oversize from the dredge *Jackson* was shipped, as the dredge had no crusher. He is now employed at the Penn plant. The dredge was designed and the construction supervised by David S. Bechtel, who is employed by the Charles Warner Co. as naval architect and engineer.

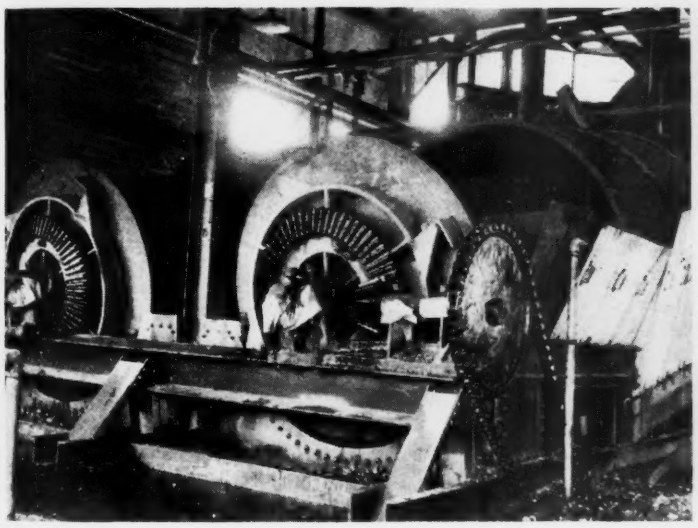
The *Betelle* is a ladder or bucket line dredge, somewhat resembling those used on the Ohio, Potomac and other large rivers. It is much shorter than these, for the same capacity, as there is no washing and screening plant on the hull. It merely digs the material and loads it on to barges by means of a belt conveyor.

The buckets are of 1-yd. capacity and discharge at the rate of 14 a minute. They are of ⅜-in. steel plate with manganese steel lips and they are attached to a manganese steel chain with links 15¾-in. pitch. The buckets pass over cylindrical pulleys above and below instead of the "five-square" or "six-square" pulleys that are generally used on the Ohio river dredges. The upper pulley, the "bull wheel," has sprockets for flanges and the sprockets have horns that engage the links of the chain and thus transmit the power to the bucket line for digging.





Left—Motor and drive of the bucket line in the plant. Right—Head pulley and horn wheel by which the buckets are raised



Left—The washing screens which are 20 ft. long and of which the main section is 10 ft. in diameter. Right—Conveyor to crushers on the lower floor

The bucket line is carried by a "ladder" of the usual type but of heavier construction than is usual. A bridle at the lower end is supported by blocks and falls and wire cables, by which the end of the ladder is raised and lowered. This is supported by a very substantial steel gantry frame.

All machinery is electrically powered, Westinghouse motors being used throughout. The bucket line is driven by a 150 h.p. motor. A 20 h.p. motor and a Fawcus Machine Co.'s hoist is installed on either side of the hull and these handle the lines by which the boat is swung and the spuds by which it is held while digging. Power comes

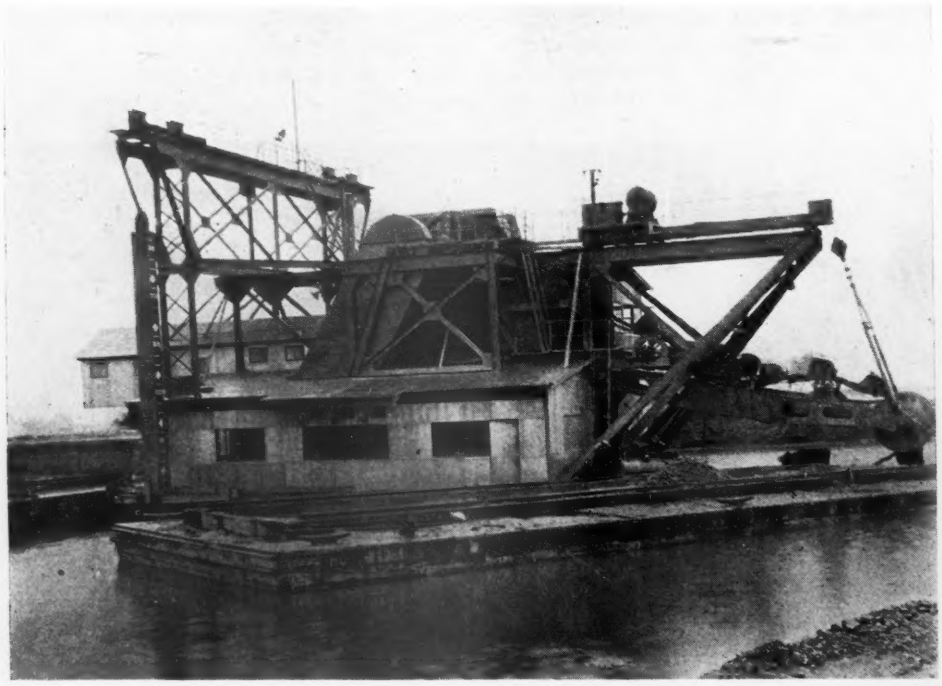
in through cables with water-proof insulation and these run to suspended reels on the dredge which automatically wind or unwind as the boat changes its position. There is a Meade-Morrison barge puller at either side which handles the lines by which the barges are brought into position for loading.

A hot-air furnace of the same type that is used for heating homes keeps the dredge warm and comfortable in cold weather and a Gould triplex pump with a 10 h.p, motor furnishes water for washing decks, fire protection, etc.

The controls by which the dredge is swung, the bucket line raised and lowered and started and stopped from digging, and the spuds raised and lowered, are in a cabin with windows all around on the front of the dredge. Instead of the heavy levers and quadrants that are used in steam dredges the controls in this dredge are switch and rheostat handles like those used by the motorman on an electric car. The controlling is not the physical labor that it is on a steam driven dredge.

The discharge from the buckets falls into a chute through which it slides to a 48-in. conveyor belt, about 40 ft. centers. This is in a sort of gallery which extends over the stern. The barge that is to be filled is run under this overhanging gallery and so takes its load from the conveyor.

The barges are of the hopper type, 80x26 ft. hulls. The hopper type is better adapted to the discharge of its load by the bucket line of the plant, as will be explained. Three barges are in use and there is ample time for the empty barge to be filled and transported to the plant while the barge at the plant is being emptied. Changing barges under usual conditions takes about five minutes, although it has been done in two minutes and when everyone concerned is fully conversant with the work it is expected that two to three minutes will be required for a change on the average. The barges are handled by a tugboat powered with full Diesel Fairbanks-Morse oil engines. It is



The dredge "John W. Betelle" with the ladder raised

The bucket line of the dredge

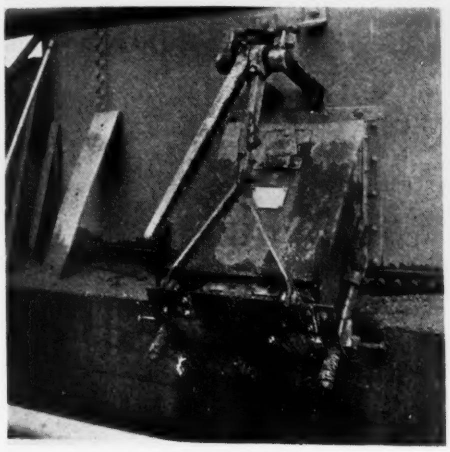
Left—The controls in the pilot house. The operator is raising a spud. Right—After end of dredge showing the conveyor under which barges are passed while loading

very quick and powerful as is shown by the way it gets the heavy barges in motion and the snappy way it gets into position for towing.

The filled barge follows the empty barge as this is drawn from the unloading point and fenders at the side prevent injury to either the unloading dock or the barge.

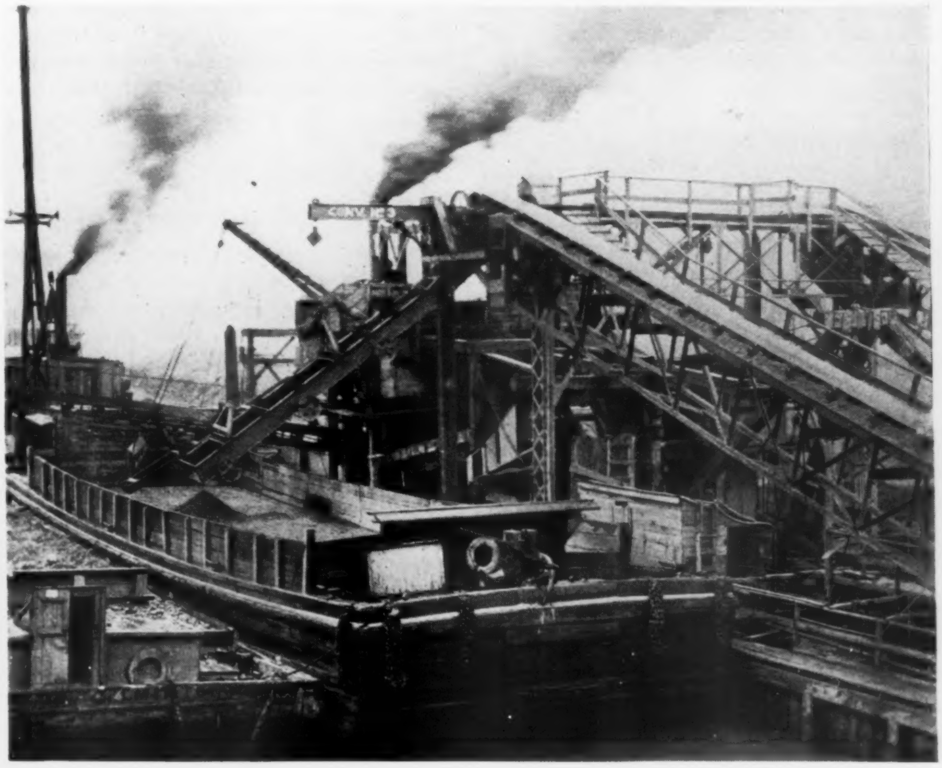
The pool is which the dredge is working is not connected with the river and the ground between the two is in part occupied by a dock with a railroad track, under construction when the plant was visited.

The plant bucket line which unloads the barges is a duplicate of that on the dredge and it is run at the same sped of 14 buckets per minute. It is driven in the same way as the dredge buckets, that is, by sprockets (horns) on the flanges of the "bull wheel," engaging in the chain that holds the buckets. The "bull wheel" is on the upper floor of the plant and with it is the 150 h.p. motor that drives the buckets and the Link Belt silent chain drive and gearing through which the power is sent to the "bull wheel." There is also a Fawcus hoist for raising and lowering the bucket line as the barges are changed. All this machinery and the bucket line are supported by a high steel bridge under which the barge to be unloaded is placed.



Type of gate used on the sand silos

No expense has been spared to insure finished products that will pass the most severe specifications. The buckets discharge into a hopper and chute which leads to the scrubbers on the floor below. There are two scrubbers, and each is a steel cylinder 21 ft. long and 8 ft. in diameter. They have an inclination of 1 in. to the foot and there are lifters inside which turn the material as it flows down the slope. A large quantity of clear water is added in the chutes leading to the scrubbers, more than sufficient to break down and put into suspension all clayey matter in the raw material.



The dredge "Jackson" which was converted to a washing plant and operated while the new plant was being built

From the scrubbers the material flows

Left—Sand recovery plant to which the sand is raised by a pump. Right—The "whirley" boat unloading a barge of gravel and placing it on a stockpile

into two large jacketed screens, of the tire and trunnion type. These screens, furnished by the Link-Belt Co., are 20 ft. long. The inner shell, which separates the oversize stones, is 10 ft. in diameter. The outer jacket separates the graded gravel from the sand. Clear water under high pressure is sprayed over the material for the full length of the screens.

The graded gravel passes through a third

Charles D. Warner, president of the Charles Warner Co.

screen slightly smaller than the main screens, and with only one shell, containing ¼ in. perforations. More high pressure clear water is directed on the gravel at this point, the sole purpose of this screen being to insure the removal of any film of foreign matter that may remain on the gravel, after the sand and scrubbing water have been removed.

Much Water Required

For these several washing steps, an enormous quantity of water is required, 8000 gallons per minute being supplied by a 16-in. Morris centrifugal pump, driven by a 200 h.p. motor.

The oversize of the screens goes to two Traylor Bulldog No. 4 gyratory crushers. When it is wanted to make ¾-in. gravel, the coarser size of gravel (1½-in.) can be added to the oversize for crushing by a change in the chutes.

The crushers are set on the floor below the screens, which is the ground floor, and are placed on massive concrete bases. The concrete is in place for two more to be added when needed. The feed is brought to them by a 30-in. Link-Belt conveyor that discharges into a hopper above the crushers. The crusher discharge is taken by another 30-in. belt conveyor that conveys it to the barge that is being unloaded. Thus it makes the circuit through the scrubbers and screens again, and any pieces not small enough to pass the required opening are returned to the crusher.

The sand washing and settling arrangements are somewhat out of the ordinary. They consist of a flume for partial dewatering of the pulp, a set of Dull cones for settling and dewatering the sand and two tall steel tanks to act as storage bins and also as final dewaterers.

Unusual Sand Recovery Plant

The sand is sent to this part of the plant, along with the water and clay and loam which accompany it from the screens, by a 16-in. Morris dredging pump driven by a 250 h.p. synchronous motor. The 16-in. pipe line goes up on about a 15 deg. incline and discharges into the end of the dewatering flume. This flume is 25 ft. long, 6 ft. wide and 6 ft. deep. At the lower end is a gate which may be raised and lowered, and this gate is set so as to allow a part of the water to flow over the gate and the rest, carrying the sand to flow under the gate and thence through chutes to the four Dull cones. The overflow above the gate drops into a cross channel and carries away a lot of the mud and clay and fine sand. The rest of this unwanted material is taken off in the overflow from the Dull cones. All the overflows join at the wasteway and flow into a launder that discharges at a considerable distance from the plant.

The Dull cones discharge into the two steel tanks (or silos) mentioned and is further dewatered by a drainage arrangement similar to that shown in Hints and Helps, March 21, issue. These tanks have discharge gates in the center of the bottom and also on the side near the bottom. The latter have been found more practical to operate. They are of the segmental type as made by Link Belt.

Although the sand is drained in these tanks it contains sufficient moisture so that it flows readily through the gates to the two conveyor belts by which it is loaded on to barges. Gravel is being continuously loaded while the plant is in operation but sand is loaded only at intervals on account of conditions at the dock. The two 30-in. conveyor belts will load a barge in about an hour when the steel tanks are full.

Provision has been made for two gravel conveyors as well as two sand conveyors, but only one is installed now. All the loading conveyors are supported on very substantial steel structures, so there is little danger that they will ever get out of line. One peculiarity noted in connection with the plant conveyors was the use of single spooled troughing rollers in place of the usual three or five angle rollers. The belts were all of the "Desco" brand, made by the Delaware Electric and Supply Co., Wilmington, Del.

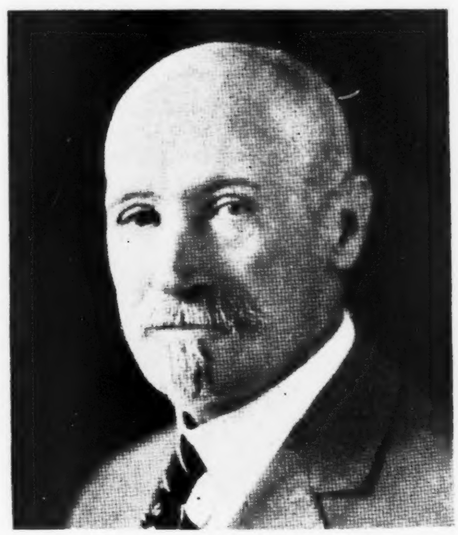
A Dravo "whirley" boat and an Industrial locomotive crane are used for stock piling.

The impression that remains most strongly fixed after a visit to the plant was its extraordinary efficiency in washing. At the time, the dredge was working at the edge of the deposit making a connection between the pond of its own making and another pond left by the dragline. The deposit was thin at this point and the overburden heavy. Occasionally the clay bottom was reached by the buckets. Hence the conditions produced a feed to the plant that was about as difficult to wash as any that could be imagined. Yet both the sand and gravel that was recovered were clean and bright; as free from any film of clay as any that has been noted in visiting plants. The answer, of course, is in the very thorough scrubbing, the use of heavy washing sprays and the abundance of water by which the clay is diluted and floated off.

Why Not a Suction Dredge?

As so much water has to be pumped, it is natural to ask why the ground is not worked by a suction dredge. The answer is in the nature of the deposit, which in the main consists of the ordinary sizes of pebbles but which also contains occasional boulders that would interfere with a suction dredge. For digging on such a large scale it is possible that the ladder dredge is the cheaper type to operate.

The Manor plant and all the other sand and gravel plants in this locality belonging to the Charles Warner Co. are under the



Capt. John W. Betelle, oldest employe of the Charles Warner Co.

general managership of Reed C. Bye. James Davidson is general superintendent of plants and Franklin K. Wills is superintendent of the Manor plant. The Charles Warner Co., with offices in Wilmington, Philadelphia and other towns and cities, is one of the largest companies producing rock products in the country. It is not only a large sand and gravel producer but an equally important producer of lime and crushed stone.

Mitchell, Indiana, Plant of the Lehigh Portland Cement Wins Safety Trophy

Award at Annual Spring Meeting of Portland Cement Association Makes John B. Sims and William Tanksley Happy—Conservation of Equipment and Materials Is Discussed

CERTAINLY no one the least familiar with the many varied activities of the Portland Cement Association can fail to see that its remarkable success as an organization is because it renders remarkable *service* to its members, who include 90-odd per cent of the portland cement manufacturers of North America. While most trade associations may be attractive to executives and managers, the Portland Cement Association has made its influence felt and appreciated to the humblest laborer in its members' plants.

It has done this not only by assisting in keeping the industry in a healthful and prosperous condition through promotional work and advertising, thus insuring steady employment and fair wages, but through its accident prevention bureau by vastly improving the working and living conditions of the laborers at the plant.

Probably no industry offers less natural incentive to cleanliness and safety precautions than the average dry-process portland cement plant, because the labor is mostly crude and unskilled, and it was long held that the plants must be dirty and untidy by force of circumstances. That attitude is rapidly changing now, although it has called forth the best efforts of H. G. Jacobsen, manager of the accident prevention bureau of the Association, and committee on accident prevention of the Association, for many years.

Mitchell Plant Wins the Trophy

No better illustration of this changing attitude could be found than the award of the Association's trophy for 1924 to the Mitchell, Ind., mills of the Lehigh Portland Cement Co., with a no-accident record just twice as good as the winner of the trophy in 1923—the San Antonio Portland Cement Co., San Antonio, Tex. Both the mills of the Lehigh company at Mitchell are relatively old dry process plants, with no primary advantage at all over scores of others. Yet the record of these two mills was 1.5 days lost per 100,000 man-hours against the winner's record of 3.6 days lost per 100,000 man-hours in 1923.

The record of the industry as a whole moved up from an average of 4.19 days lost per 100,000 man-hours in 1923 to only 3.41 days lost in 1924. It is the slowness of about 25% of the plants in the Association in taking advantage of the experience of the others in safety work, that keeps the average down; for it was stated that 75% of the plants have twice as good an average as the remaining 25%.

John Sims, mill foreman of Lehigh mill No. 2, and Wm. Tanksley, mill foreman of Lehigh mill No. 1 at Mitchell, Ind., were honored guests of the Association at its annual spring meeting in New York City, and were awarded the much coveted trophy. Others at Mitchell entitled to share in the credit for this fine record are W. H. Westknecht, superintendent of the two mills, and H. H. Purkhiser, master mechanic.

As usual, much attention at the meeting was devoted to reports of the committees on conservation and technical problems. It is evident that every effort is continually being made to manufacture cement more efficiently and to make better cement.

The studies of clinker grinding are progressing and much valuable data is available to member companies which will make toward greater efficiency in this costly operation.

The study of the constitution of portland cement with the co-operation of the Association and the Bureau of Standards is already upsetting much previously accepted data and

Safety trophy won by the Lehigh Portland Cement Co.'s mill at Mitchell, Ind.

has advanced beyond any similar research in any other part of the world. The laboratories have been visited and favorable comments made by some of the foremost portland cement experts from abroad.

The structural materials laboratory conducted by the Association in Chicago is developing into a post-graduate school, for study courses at which engineers from all over the country are making application. It is proposed in the near future to add to the research facilities of the Association a complete experimental portland cement plant.

Lubrication of Cement Mill Machinery

Conservation in production methods is extending to study of lubrication in cement mills. A paper at the New York meeting by J. A. Marland, technical manager, Chicago branch, Vacuum Oil Co., summarized practice in this field. He favored specially prepared oils as against grease for lubricating compeb and kominuter mill bearings, and a selected oil applied by wick oilers to trunion bearings of kilns. Mr. Marland showed illustrations of gyratory crushers with pressure circulating oil systems and stated that he believed this type of lubrication would be extended to other heavy-duty cement mill machinery.

Clinker Rings

A paper by W. J. Maytham, consulting engineer, Northwestern States Portland Cement Co., Mason City, Iowa, and the subsequent discussion covered nearly every phase of this most annoying problem—from theories as to the cause of rings and their prevention to shooting them out with the latest type of clinker shot gun. Ernest Ashton (Lehigh Portland Cement Co.) said they were caused by the very thing one did want to do in a cement kiln—by fusion of the materials. The way to avoid it, he said, was to prevent fusion, preferably by adding quartz to the mix.

Various other theories and practice were explained showing that the subject was one of very general interest. Experience in getting rid of the rings, once formed, also came in for much interesting discussion. Several have had experience in the use of the new gun especially designed for this work, but the estimates of the number of shots required varied between very wide limits. Evidently this gun is not the last word in clinker-ring removal.

Two Interesting and Inspiring Addresses

It was a treat that few who had the good fortune to partake will soon forget, to listen to after-dinner addresses by A. L. Reeves, secretary of the Automobile Chamber of Commerce, and Arthur Brisbane, editorial writer for the Hearst newspapers, probably the most read writer in the world. It was evident from the facility with which he spoke that the pertinent wisdom which flows so readily from his finger tips flows no less readily from his lips.

His address left no doubt in the minds of his listeners that he believes in the permanency of concrete. And he has not been converted in an academic way since he has had much experience as a farmer on a large scale, and as a builder and owner of New York City apartment houses. While Mr. Brisbane believes aeroplanes (or some type of flying machine) will soon come into very general use for transportation of passengers, he sees no need for worrying about the future of highways, because the general use of aeroplanes will require extensive landing facilities, and these landing facilities will be provided by concrete roads so wide that the planes can land, or rise, without interference with automobile traffic.

Mr. Reeves could not foresee any saturation point to automobile consumption and use, except the present limited highway facilities. Hence he spoke enthusiastically in favor of more paved highways and more co-operation between the automobile manufacturers and road builders.

Col. E. M. Young, as toastmaster, said not no business association and no service rendered during his business career had given him more genuine pleasure and satisfaction than his Portland Cement Association work and responsibilities; and that he believed he spoke the unanimous sentiment of every member.

Lehigh Valley Safety Meeting of the Portland Cement Association

Holders of World's Safety Record Tendered Great Ovation at Annual Dinner

JOHN SIMMS and William Tanksley, representatives of the Mitchell (Ind.) safety committee at the Lehigh Portland Cement Co. plant there and holders of the world's safety record, were guests of honor at the annual meeting and dinner of the Portland Cement Association's Eastern district safety committees held in the Hotel Allen, Allentown, Penn., on May 21.

The two men had come East to be the guests of the Portland Cement Association at its annual meeting in New York and stopped off in Allentown on their way home. They were tendered a great ovation, for their record of but 1½ days lost in 100,000 man hours is known in every one of the 110 cement mills whose safety committees were entered in the contest last year for the national trophy.

The safety committees present represented every mill in the Lehigh district and there were 185 men who attended a round table conference during the afternoon. In the evening at the dinner, addresses were made on pertinent subjects by Rev. H. M. Prentiss of Easton and Nathan C. Rockwood, editor of ROCK PRODUCTS.

Prominent guests included A. C. Tagge, vice-president of the Canada Cement Co., of Montreal; H. G. Jacobson, manager of the bureau of accident prevention and insurance of the Portland Cement Association; W. P. Sabin, secretary of the Ash Grove Lime and Portland Cement Co., Kansas City, Mo.

In line with the national program and following the initiative of the Lehigh Portland Cement Co., which began the movement five years ago, the month of June will be one in which a special safety campaign will be put in every cement mill in the district, as well as in the country. The effort is to have not a single accident mar the record of the month.

Successful Safety Work Means Better Attitude Toward Work

Without question the most important thing brought out in this meeting of mill operators from all over the Lehigh Valley was the fact that successful safety work depends on a thorough understanding of the one's fellow man and a desire to extend to him a little brotherly love and sympathy—not sentimental sympathy, but the sympathy of an understanding of his troubles and shortcomings.

One speaker truly pointed out that a man who has some burden on his mind is not a good accident risk and the real way to keep him out of an accident is to give him an opportunity to relieve himself of his mental burden through sympathy and understanding.

In discussing safety work at the Mitchell plant, which enabled it to win the trophy, Mr. Sims laid great stress upon careful preliminary planning of the safety committees' work and the careful fixing of responsibility. Foremen in various departments were held strictly accountable for injuries to men under them—the names of the foremen who had accidents being prominently displayed on a news bulletin board.

Throughout the very interesting discussion of safety work the listener could not help being impressed with the splendid spirit that safety work is instilling into the minds of all responsible for the work and employment of others.

The plant and part of the three-rail tramway connecting it with the quarry

A Mountain Rock Crushing Plant

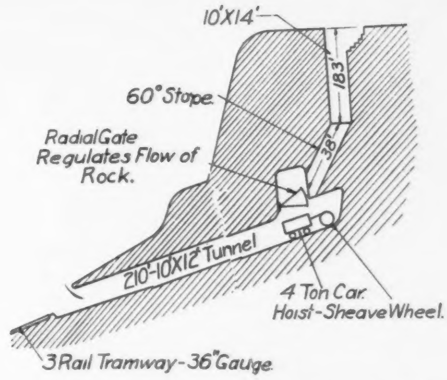
New Plant of the Golden Basalt Products Co., Golden, Colo., Is an Excellent Application of Mining Methods to Crushed Rock Production

By Charles A. Breskin

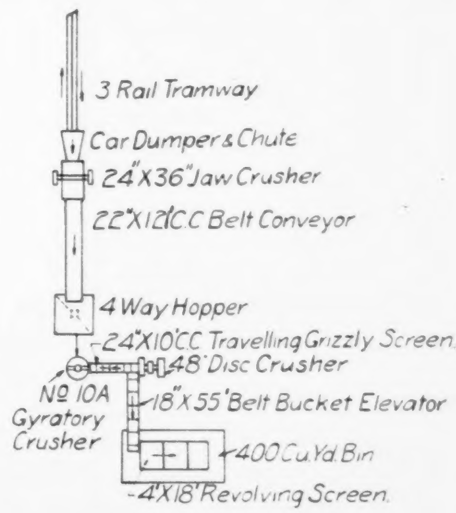
JUST 15 miles from the heart of Denver, and in the foothills of the Rocky Mountains, the Golden Basalt Products Co. has erected a rock crushing plant that is unique in many respects. It was designed and built by James Lawrence, who for almost 30 years was assistant city engineer of Denver and who for the last few years was engaged in contracting work. The plant was originally intended to supply rock for Mr. Lawrence's construction projects but it quickly outgrew them and now its main purpose is furnishing concrete aggregate for Denver and its environs. There is a good demand for high grade aggregate in this vicinity and the Golden Basalt Products Co. is one of the first to be in the market with a high grade product.

The plant is two miles north of Golden, Colo., on a site known as North Table Mountain. Towering 711 ft. above the level of the crushing plant is a huge deposit of basalt, which is a dark volcanic rock of unusual resistance to crushing. It is one of the varieties of rock called trap in eastern quarries. The deposit is 30 acres in extent and runs from 183 to 200 ft. in depth.

To get out the rock the "glory hole" method of mining is used. This method uses a system of haulageways beneath the block of stone which has had its top surface exposed by the removal of overburden and the haulageway connected with the surface by raises. The method is shown by one of the accompanying sketches.



Section which shows the "glory hole" method of quarrying



Flow sheet of crushing plant

A 3-track tramway extends 1475 ft. from the initial crusher to the opening of the main passageway. The steepest grade in this tramway is about 38%. The main tunnel or adit is 10x12 ft., running 210 ft. on a 10% slope. At the base of the tunnel is a sheave wheel hoist direct connected to a 35 h.p. slip ring motor. The hoist and motor serves as a booster and brake, since loaded cars are

The secondary crushing and screening plant. The feed from the primary crusher comes in on the belt at the left

gravitated to the initial crusher and the loaded car going down pulls the empty one up.

From the roof of the main tunnel near the base there is a raise on a 60 deg. slope, 38 ft. up, and from there another raise 10x14 ft. extending vertically 183 ft. to the top of the mountain. The idea of the 38 ft. stope is to check the fall of the material and to act as a chute, delivering the rock to a bin formed in the main tunnel. There is a radical gate here which regulates the flow of rock to the cars.

The rock is quarried in benches around the vertical raise, pneumatic rock drills being used for drilling. The holes are drilled from 6 to 6½ ft. in depth and loaded with 40% dynamite and shot electrically. The number of holes shot depends upon the location of the bench. For drilling 4 Model 95 Denver rock drills are used and 5 Ingersoll jackhammers. A Sinclair rock drill bit sharpener is located on the site so that newly sharpened steel can be furnished without waiting.

It is estimated that the present hole contains 325,000 cu. yds. of rock and at the rate of 500 tons removed per 8-hour day, the present workings will last for some time. To operate the quarry at the 500 ton capacity requires 12 men.

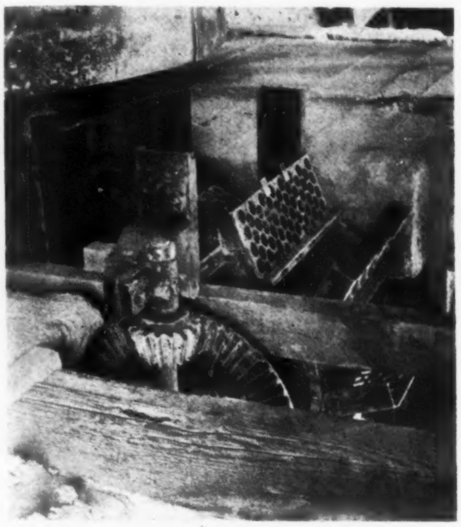
The loaded cars going down the tramway are end-dumped into a 15-ton chute feeding a 24x36-in. all steel Buchanan jaw crusher, driven by a 75 h.p. Westinghouse motor through a Link-Belt silent chain drive. The arrangement of crusher drive is illustrated in one of the accompanying sketches.

The initial breaker crushes to 4½ and 5 in. The discharge is so arranged that the rock hits a steel plate under the crusher thus "taking the fall out of it." It is deposited on a 22-in. wide by 121 ft. Republic belt conveyor, running on an 18-deg. inclination and discharging into a 200-ton 4-way hoppered bin.

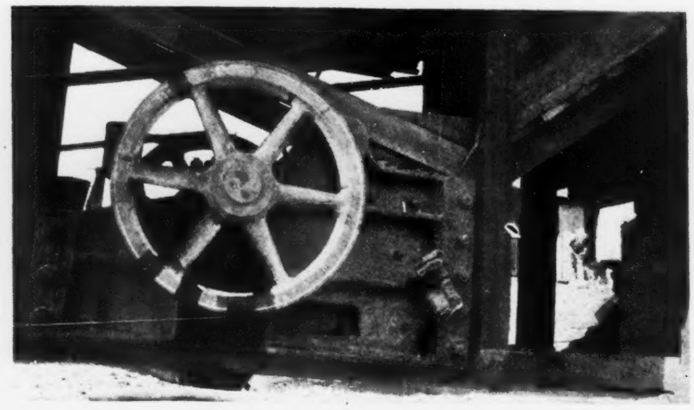
The crushed rock is fed from the bin through a radial gate into a No. 10A Telsmith gyratory crusher. This reduces to 2-in. and under and discharges to a combination traveling grizzly and screen, 24 in. wide and 10 ft. centers. The grizzly screen consists of sections of steel plate with 1 11/16-in. perforations. The material under 1 11/16-in. goes directly to the boot of bucket elevator while the oversize is discharged to a 40-in. Symons disc crusher. The disc reduces the rock to ⅞-in. and under and discharges to the same bucket elevator recovering from the grizzly screen. The bucket elevator discharges the rock to an 4x18 ft. hexagonal revolving screen, divided in 3 sections. One section has 5/16-in. perforations, the second 1-in. and the third 2-in. Any of the sections may be changed in accordance with market demands. The screen discharges into the bin below from which cars are loaded. The bin has a 400 cu. yd. capacity.

The entire secondary crushing and screening plant is driven by a 150-h.p. General Electric motor. The plant product is shipped to Denver and other points on the Colorado and Southern R. R.

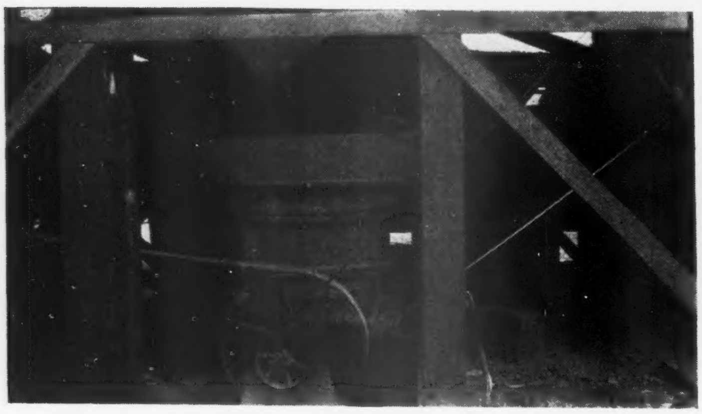
The company receives its power from Golden at 11,000 v. at its own transformers. This is stepped down to 440 and 110 v. under which voltage the plant operates. Air for rock drill operation is furnished by a 250 cu. ft. Laidlow compressor and is piped to the top of the mountain through a 2-in. pipe extending 2000 ft.



The "traveling grizzly," a unique form of screen. Note method of driving



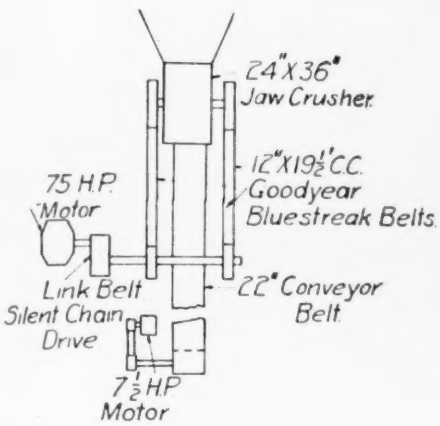
The primary crusher is an all-steel jaw crusher



Left—A gyratory crusher is used for a secondary breaker and a disk crusher (right) for fine crushing

The company is a pioneer in the district and in the designing of the plant there was little or no precedent to follow. Many obstacles had to be overcome and considerable of the equipment was built right on the job. Great credit is due James Lawrence and his son, R. J. Lawrence, who built and now operate the plant.

Although its output is not large this is one of the most interesting operations that has been described in ROCK PRODUCTS. It is



Drive of jaw crusher

evident that the designers were familiar with mining engineering practice and methods and they have applied these to crushed rock production in a most commendable way.

Heat Process for Treating Phosphate Rock

GEORGE R. FISHBURNE, in the May 2 issue of *American Fertilizer* describes the Newberry-Fishburne-Barrett process for calcining phosphate rock, which he says has been developed not only to produce a suitable plant food but also to obtain a product which would meet the various requirements of various state laws governing the sale of commercial fertilizer. The process is briefly described as follows:

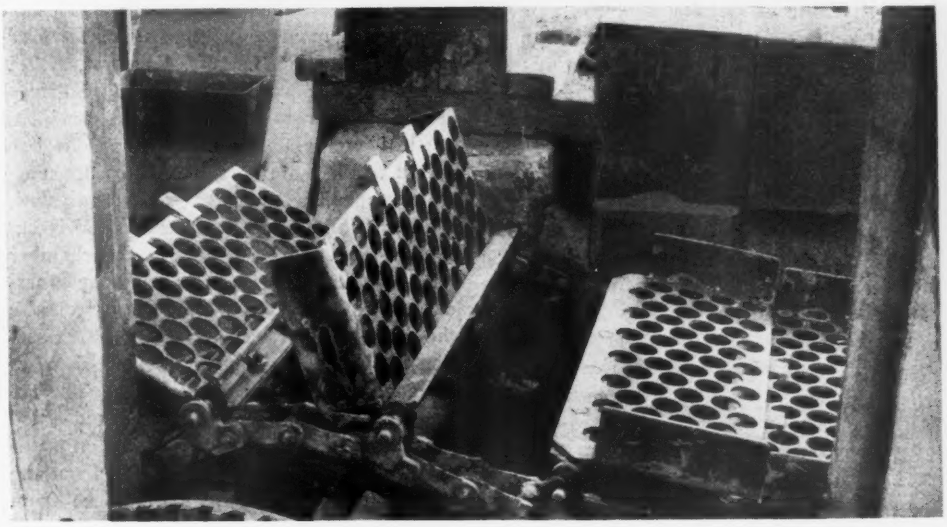
"As a practical example of our process, we take ordinary phosphate rock and pulverize it; then we add to it from 5 to 15% of its weight of a reagent or of a mixture of two or more reagents. We prefer to use sodium sulphate or bisulphate on account of the cheapness of these reagents, and the ease with which they undergo decomposition under the conditions of calcination. The mixture is then so prepared that it will become porous, and it is then introduced gradually into the upper or feed end of a revolving cylindrical kiln, lined with refractory material, preferably of a basic character, and internally heated by a flame of coal dust, oil or gas. The kiln is slightly inclined toward the fire end, and revolves at a rate of about one revolution in one or two minutes.

"The fuel is fed into the kiln in intimate mixture with air, and additional air is admitted in such amount that the fuel is completely consumed in the lower part of the kiln, and that a moderately oxidizing atmosphere prevails throughout the interior space, care being taken to avoid admitting any considerable excess of air above that required for perfect combustion. The temperature in the hottest zone, at about one-fourth the length of the kiln from the fire end, is maintained at about 2500 deg. F. (1482 deg. C.) The temperature should be regulated so as to bring the material to a sintered or semi-fused and porous condition, and to yield a product of maximum and practically complete citrate-solubility.

"In the first stage of the heating the temperature of the charge increases rapidly, and under the combined action of heat, agitation and intimate contact with a rapid current of hot gases the alkali-metal compound is rapidly decomposed, with evolution of its acid or other volatile constituents. This action takes place actively at a temperature of about 2000 deg. F. (1093 deg. C.), provided the material is porous and the current of hot gases sufficiently rapid. Under these conditions such alkali-metal compounds as hydrate, sulphate or carbonate, which are scarcely affected by heating to much higher temperatures when at rest, are rapidly decomposed with evolution, respectively, of water, sulphur dioxide and oxygen, and carbon dioxide, leaving a residue of alkali-metal oxide, which we term 'residual alkali.'

"The volatile constituents may be said to be 'blown out' of the salts by contact with the current of hot gases. It is probable that the residual alkali enters into combination with the phosphate of lime, forming an alkali-lime phosphate, which is again in large measure decomposed at the higher temperature of the later stage of the process, and that this combination and subsequent decomposition plays an important part in the conversion of the phosphate into citrate-soluble condition.

"In the final stage of calcination under the combined action of heat, agitation and intimate contact with a rapid current of highly heated gases, the residual alkali is in turn and in large measure volatilized, and simultaneously with the expulsion of alkali the percentage of citrate-soluble phosphoric acid rapidly increases, until, with proper adjustment of temperature and duration of heating,



Close-up of traveling grizzly showing how the screens overlap

the conversion to citrate-soluble condition becomes practically complete, only traces of insoluble phosphoric acid remaining.

Comparative costs of this method and the usual method of making acid phosphate are given as follows:

Cost of Making Acid Phosphate with 60 deg. Acid Costing $10 per Ton

2200 lb. 50 deg. acid to convert 2200 lb. rock	$ 9.02
Power, labor and miscellaneous (supervision not included)	2.50
Total	$11.52

Cost of Conversion of 1 Ton of Rock by Calcination

Fuel	$1.50
Reagent	1.20
Power	.50
Labor and supervision	1.00
Replacements	.25
Miscellaneous, insurance, etc.	.25
Interest on investment	.40
	$5.10

The product is said to be good for any and all uses to which acid phosphate is applied.

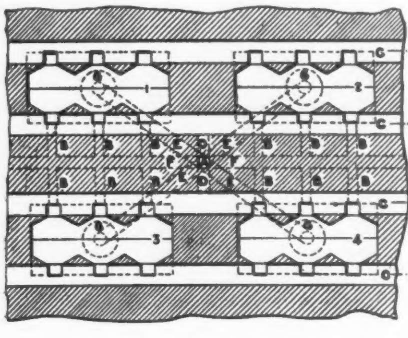
State Excise Taxes Held Illegal

STATE excise taxes on foreign corporations engaged exclusively in conducting an interstate business, were held unconstitutional recently by the Supreme Court.

Disapproving a former decision rendered in the case of the Baltic Mining Co. vs. Massachusetts, the court, in the case of the Alpha Portland Cement Co. vs. Massachusetts, asserted that the tax under consideration was not materially different from one declared unconstitutional in another case, that of Cheney Brothers Co. vs. Massachusetts.—*Topeka (Kan.) Capital.*

Finds "Glory Hole" Mining Cheaper Than Quarrying

At the October, 1924, meeting of the San Francisco section of the American Institute of Mining and Metallurgical Engineers, R. A. Kinzie, chairman of the section, presented an impromptu description of the application of the glory-hole method of mining to a limestone deposit at Davenport, Calif. The deposit was formerly quarried by steam shovels and the bench system. The overburden, which is sandstone in part and in part shale, ranges from 50 to 100 ft. in thickness. The limestone deposit is trough shaped, about three-quarters of a mile long, 1200 ft. wide and of varying thickness. The limestone is used by the Santa Cruz Portland Cement Co. in the manufacture of cement. This report is taken from the *Engineering and Mining Journal-Press.*



Section through chambers and cross cuts

The lower end of the deposit was worked until the bench reached a height of 350 ft. At this point a change in methods took place. Mr. Kinzie devised a system of quarrying by means of glory holes. The general plan consists of main adit at 400 ft. elevation which intersects the center of the deposit. Drifts are turned off at an acute angle and are extended parallel with the main axis of the deposit.

The arrangement of the glory holes in groups of four is shown in the accompanying figure. *C, C, C, C* are drifts which are driven in pairs at 60-ft. intervals. A distance of 50 ft. separates the contiguous drifts of each pair. These drifts connect by chutes to four bulldozing chambers, 1, 2, 3, 4. In the center of each bulldozing chamber a vertical transfer raise, *G*, extends to the surface. The bulldozing chambers are 30 ft. above the floor of the drifts. Each is 80 ft. long and 60 ft. wide, and is served by six chute mouths. The bottom of the bulldozing chamber is sloped 50 deg. each way from the longer axis.

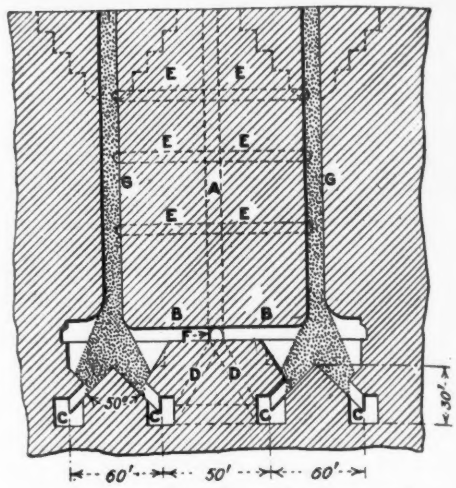
An intermediate drift, *F*, 30 ft. above the lower drifts, *C*, and connected to the lower drifts by inclined raises, *D, D*, extends through the center of the 50-ft. block between the drifts. Short cross-cuts, *B, B*, extend to the bulldozing chamber opposite and above the chute raises. At the center of the square established by four bulldozing chambers a manway raise, *A*, extends to or near the surface. On the diagonals, *E, E, E, E*, of the square connections are driven to the transfer raises *G, G, G, G*, at 40-ft. vertical intervals. Their function is to give access to the main chutes at different points so as to enable stoppages to be remedied.

In each bulldozing chamber a shelf is cut in the wall, to give access to the chamber on all sides. This connects with the cross-cuts *B*. At the bottom of the transfer raise the broken limestone forms a cone (in section). The roof of the bulldozing chamber is coned out at the transfer raise. The arrangement provides safe access and good ventilation, and bulldozing can go on without regard to the drawing of ore from the chute mouths or without interference from the glory-hole operations. The large pieces float to the outer surface of the cone and can be block-holed and blasted conveniently.

No grizzly is used. The loading chutes are provided with arc gates of the Perseverance type. Chute mouths are 6 ft. 6 in. wide by 5 ft. high, and pieces up to 4x5x3½ ft. can be passed through. To prevent gushing and overrunning of cars, hammers made of cast iron are suspended 1½ ft. in front of the openings, and these retard the flow of rock sufficiently to bring it under control. The front of the hammers is protected by pieces of wrought iron, which are so fastened as to leave a 1-in. space between the casting and the side toward the chute. This expedient was found to prevent all breakages caused by bulldozing at the chute mouth, which is sometimes necessary.

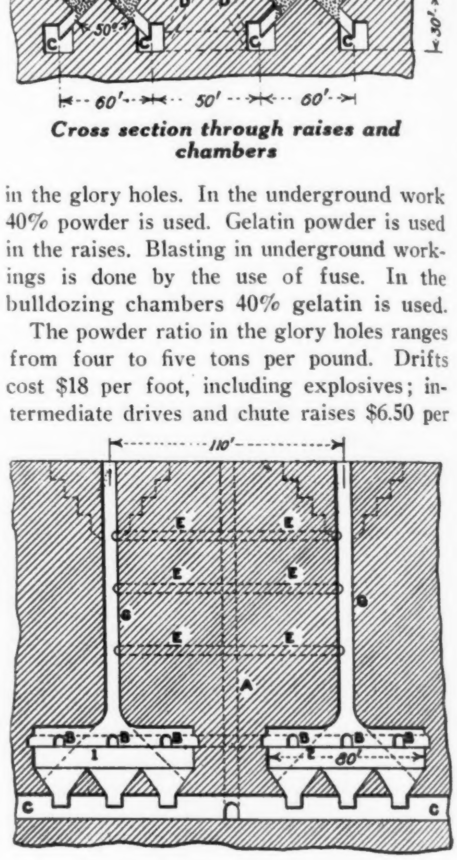
The center drift, *F*, and crosscuts, *B*, are 5x6 ft. in section. The main transfer raises are 10x10 ft. in the clear and are raised in sections from the connecting passages *E*. The manway raise is 5x8 ft. in section and is driven as a raise. Chute raises are 6x8 ft. and are driven on an angle of 50 deg. The raise is provided with a staggered ladderway, the platforms being 14 ft. apart. Ladders are constructed of 4x4-in. side pieces and rungs are 1-in. pipe. Main drifts are 9x12 ft. in section. One is provided with a 3x4-ft. drain ditch. The main drifts were driven by a pyramidal cut with 32 holes per round of 6 ft. The limestone drills easily. Holes are blasted in three groups and not all at once. The latter procedure was unsuccessful in the limestone.

The bedding of the limestone dips 15 deg., which is an advantage in breaking the benches at the glory holes. Jackhammers are used, and holes are 18 ft. in depth and are spaced 8 ft. apart. From 12 to 20 holes are blasted at once by means of electric blasting caps and machine. No. 1 special Hercules is used in the glory holes. In the underground work 40% powder is used. Gelatin powder is used in the raises. Blasting in underground workings is done by the use of fuse. In the bulldozing chambers 40% gelatin is used.



Cross section through raises and chambers

The powder ratio in the glory holes ranges from four to five tons per pound. Drifts cost $18 per foot, including explosives; intermediate drives and chute raises $6.50 per foot, and main raises $12 to $14 per foot. Underground work is done by contract. The tons per man per shift ratio is 100, although on a longer interval the average would probably be 80 tons per machine drill shift for all work up to the transportation.



Longitudinal section through chambers

The cars are of the solid-bottom type, holding 14 tons, but only loaded up to 12 tons. They are hauled underground by storage battery locomotives.

Three bulldozing chambers are now in use on clean limestone, and a fourth is on mixed limestone and clay. Raises are driven at a rate of 150 ft. per month. A 250-ft. raise requires about one and one-half months. From three to four months is required to bring a bulldozing chamber into operation. Explosives cost 4 cents per ton. Breaking and delivery to cars at the chutes costs 11½ cents per ton. The total cost, including delivery to the crushers, involving a four-mile haul, is 30 cents per ton. These are operating costs over a three-months interval.

German Portland Cement Makers Discuss Technical Progress and American Methods

Greatest Advance Shown in the Manufacture of High Test Portland Cements, but Research Has Brought Out Interesting Facts Connected with Standard Portland Types—Comparison of German and American Practice

THE well attended meeting of German portland cement manufacturers, held in Berlin, March 11 to March 13, was under the chairmanship of Dr. H. Muller of Kalkberge, whose report showed great scientific activity for 1924. It stood forth chiefly as the year in which the manufacture of high test cement had become the common property of the industry. Scientific investigation has been prosecuted actively with the result of new developments and promise for the future. The association's laboratories at Karlshorst, Dr. Muller said, are to be extended because of the demands made on them. The scope of the work is to be widened. Not only are the raw materials entering the kilns to be the subjects of extensive and careful research, but the auxiliary products such as lubricants, coal and oil will be subjected to constant testing. Facilities will be provided for increased work on burning and grinding cements. Of especial interest is an addition to the laboratories for testing concrete products. A museum is also planned for the exhibition of materials and products of the cement industry.

The kiln committee was instructed to investigate and report on waste heat boilers as used in the United States and Great Britain. The committee on cement machinery was instructed to report on grinding machinery and to indicate the effectiveness of various types, their probable life and their power consumption so that the industry will be in a position to select the types with the best over-all advantages.

New Standards for High Test Cements

The interim report of the committee on the revision of standards said that a final report on the proposed changes in the standards could not be given until more work had been done on high test portland cements which were still in the course of development and investigation. The presentation of a new set of standards would be premature. The results already obtained would justify proposing figures for the minimum strength of high test portland cement of 3550 lb. per sq. in. under compression after three days setting and of 6390 lb. after 28 days combined setting. A lively discussion followed in which Director Schindler pointed out the advisability of limiting the temperature range within which the setting tests should be carried out. He stated that in the case of high test cements the strength figures depend to a large extent on the temperature during the setting process and that entirely different figures are obtained for high test cements, depending on whether they are allowed to set at 10 to 12 deg. C. or at 15 to 18 deg. C. [Recent American investigations have also shown the importance of close control of temperature in strength tests.—Ed.]

THE year 1924 has seen the development of the high test cement industry in Germany. Fifteen mills now make it where only two made it before.

German standard portland cementment is being more finely ground and shows greater strength.

Research has shown the importance of control of temperature and moisture in strength tests.

The points of American practice which most impressed German observers were the use of waste heat boilers and pulverized coal.

Petrographic methods have shown interesting results in cement investigation.

A new Danish cement, which can be used in place of fused cement, is reported.

Privy Councillor Schott stated that he had called attention to this and had made proposals for standardizing the temperatures. Chairman Muller remarked that his own studies had shown that totally different figures are obtained, depending on whether the test blocks were allowed to harden at the ordinary cellar temperature, called for in the usual directions, or at the temperature prevailing under practical operating conditions. He pointed out that figures obtained in the laboratory should not be assumed to represent field conditions exactly.

Government Would Lower Standard Requirements

Dr. Riepert of Charlottenburg said that the Ministry of Communications had proposed in a bill that standard specifications be changed from 6390 lb. after 28 days setting to 1100 lb. He stated that it would be highly desirable to all concerned to consult representatives of the industry before such important changes in the specifications were made. The official representative of the Ministry of Communications who was present declared that the ministry was working in co-operation with the industry and that the figures proposed in the bill were not final.

Finer Grinding and Higher Strength in German Product

Dr. G. Haegemann of Karlshorst read the report on the laboratory work of the association, which said that the results both for standard portland cements and for high test cements had been compiled into tables. These tables showed that in the case of the 159 standard portland cement samples tested in the year 1924 the retention on the standard screen was less than for the previous years. The specific weight of portland cement has remained unaltered for the past 10 years. The binding properties were the same as for the year before, but the strength values showed an increase. The average strength under compression after 28 days setting under water was 4885 lb. per sq. in., and after 28 days combined setting 5425 lb. The tests show that 78% of all the plants are in a position to manufacture a portland cement which will show a strength test of over 4970 lb. after 28 days. As to high test portland cements, whereas only two mills were manufacturing this product in 1923, in September, 1924, 15 works were engaged in manufacturing it. Special cements are now being manufactured which after three days setting under water show a strength of 5680 lb. per sq. in., and after 28 days combined setting a strength of over 9940 lb. per sq. in. This is a distinct advance. The tensile strength also increases with increasing strength under compression. In any case, high test portland cements are now in a stage of active development.

Effects of Temperature and Moisture On Hardening

A series of purely scientific investigations have also been conducted in the laboratory. Experiments with fused cement show that the opinion of Michaelis, according to which fused cements show higher strength values, is no longer in accord with the facts. With fusion smaller strength values result than

with sintering. A series of samples were investigated for their titanium content and an average value of 0.013% was found. Tests showed that the influence of atmospheric moisture in the combined setting tests may cause variations as large as 10%. Tests were also carried out to determine the initial strength at ordinary and at low temperatures. Here also differences occurred on setting in water of 14.5 deg. and 20 deg. C., which amounted to 25% after two days and was still 12% after three days. The influence of temperature on the strength of standard test blocks made of 1:3 mixture at room temperature and at 5-7 deg. C. was determined. After three days there were differences of 30-60%. There is still much doubt as to the nature of this effect, and the different results attained in winter and in summer must be recognized, as they are of the utmost importance in construction work. Tests with alumina cements show that the compression strengths are very high but tensile strengths are lower than those for high test portland cements.

Blast furnace and slag cements were investigated and experiments were conducted on the utilization of ashes and lignite slags. Tests were also made to determine if the favorable effect of water glass which has been claimed actually occurs. Dr. Haegemann said that it was found that the strength was not improved, but with increasing water glass additions the strength actually diminished.

High Test Cement or More Standard Cement?

The significance of substances added to cements was determined and this deserves more careful investigation. With the utilization of high test portland cements the use of high grade additions requires a rather definite object in view. A series of tests was then made on high test portland cements. According to Director Muller, one part of high test cement costs as much as 1¼ parts of ordinary cement. Investigations were made to determine whether mixtures of one part of high test cement with sand showed the same properties as the mixtures with 1¼ parts of ordinary cement. Equivalent results were obtained with one brand of cement, but in the case of other brands the results were not so good.

The Standard Screen

In the discussion which followed, Dr. Strebel remarked that the decrease in the differences of the values between water hardening and combination hardening might be ascribed to the abnormal weather conditions prevailing in 1924. Probably the matter of grinding plays a part. A diminution in the screen residue occurred in 1924. This increase in fineness occurs especially with high test portland cement. Screen tests can make no claim to exactitude. If we wish to determine the true structure of the material we must adopt a 10,000 mesh screen (that is, 10,000 meshes per square centimeter, or about 250 per linear inch). Director Grimm opposed the 10,000 mesh screen which serves to introduce an element of danger into practical work, as it gives too high figures, and higher apparent values are arrived at than are obtained in practice. It is important to take into consideration the moisture content of the air and to determine its influence on hardening. He also indicated the differing results obtained by testing according to the Austrian and the Swiss standards. This is probably due to the various methods of tamping down the individual test pieces.

Dr. Schott stated his opposition to the opinion that the 10,000 mesh screen had no advantage in the determination of fineness and desired to have an investigation made to decide which size of particle is most effective for cement and whether it is that which passes the 5000 mesh screen or that which passes the 10,000 mesh screen. According to Michaelis, too great a fineness of particle should cause a diminution in strength.

Dr. Dyckerhoff called attention to his investigations on the addition of powdered sand to portland cement, which had led him to different conclusions than Dr. Haegemann. His own results led him to doubt whether standard sand is suitable for the testing of high test portland cement. All other countries have a larger proportion of fine sand in their standard sand, and it may be that the higher strength figures obtained, for example, in Holland, Switzerland and other countries are to be ascribed not only to different methods of testing but also to the different standard sand. Dr. Muller remarked that in selecting the German standard sand attention was not devoted to obtaining the best strength figures but merely to finding the most suitable sand. The German standard procedure results in obtaining unified testing methods which have nothing to do with the magnitude of the strength figures.

Effect of Water Glass

Dr. Muller asked how the proposal opposed by him on the saturation of cement roads with water glass was to be decided. Dr. Kuhl answered that according to his results the after treatment of concrete roads with water glass could not be considered as favorable and that his results with alkalis indicate that harmful effects will result. The final decision is to be made, however, only after tests in use.

Dr. Kuhl remarked that according to his tests also the strength of cement was diminished by the addition of water glass. More dangerous is its influence on the setting period. Water glass on account of its strong alkalinity delays the setting.

Researches on Lower Temperature Compounds

Dr. Kuhl of Berlin-Lichterfelde delivered the Report on Progress at the Technical Cement Institute of the Technical High School at Berlin. The courses of the school include in their scope the method of plant operation, investigation and preparation of portland cement, substitution of the various components by others and the finding of suitable new materials, and thus covers both teaching and investigation. Obtaining of satisfactory strength figures does not consist simply in a methodical increase in the lime content, but on the proper proportioning of the individual components. Tests were made to determine how the reactions which proceed at the sintering temperature of portland cement can be carried out at lower temperatures. By addition of fluorspar, bonding materials can be obtained at lower temperatures which are not inferior to portland cement. Even at low burning temperatures eutectic fusions are obtained which induce clinkering. A hard burned clinker is obtained which does not slake with water and can be broken up only by grinding. Researches were also undertaken on the cause of red color which sometimes appears in portland cement and is ascribed to the reducing flame. However, the color change has nothing to do with the reducing flame as the tests show, but is due to a dissociation of the iron oxide.

Titanic Acid in Cement

According to Michaelis, the alumina of portland cement can be replaced by iron oxide and chromium oxide. It was interesting to determine whether the silica could also be replaced. [A recent German patent covers the smelting of titaniferous iron ore to produce iron and a slag in which titanic acid in part replaces silica.—Ed.]

Tests showed that small quantities of titanic acid do not affect the cement injuriously, but that larger quantities are harmful and very large quantities are destructive. Titanic acid does not have the cementing power of silica. If silica is replaced by titanic acid we must use a lower lime content. The problems of hardening were studied and also the solubility of calcium aluminate. It could be shown that colloidal chemical phenomena play an important part in the hydration of the aluminates. In conclusion the speaker expressed his pleasure that the cement industry and the machinery industry had evinced their interest in the Institute and and that the requests for men trained in the Institute had increased. The importance of the chemist in the cement plant is greater than ever before.

Cause of Red Colored Cement

In the discussion which followed on the question of the coloration of the cement clinker it was brought out that on rapid cooling the red color often appeared, while if the clinker was passed through the cooling drum in the usual manner it came out gray. Dr. Kuhl stated that the color was observed if the glowing clinker was dropped

into water, but that clinkers which were not quenched were also often red. This is not opposed to the theory. At the highest sintering temperature the iron is not chemically bound but is present as metallic iron. The ferrites are formed only at lower temperatures. The quenched clinker could easily be molded, while that taken from the kiln later had a fixed volume and shape and could not be pressed. A further union with lime must have occurred.

What the German Observers Saw in America

Dr. Muller reported on the participation of the representatives of the German Association in the Centenary Celebration of the discovery of portland cement held at Chicago. He portrayed the advances which had occurred in the last 12 years in the American cement industry. The number of good concrete roads in the U. S. is remarkable. As many barrels of cement were used for road building in the U. S. in 1923 as Germany manufactured for all purposes combined, namely 25,000,000 bbl. They had the opportunity of seeing such a road constructed. Ten skilled workers and 25 laborers are able to lay a section 1070 ft. long and 10 ft. wide per day. The road is given a base of double steel reinforcement; this is covered with wet concrete which is not tamped down but only smoothed out.

He said the use of waste heat boilers is quite common in the United States, and gave an outline of the largest cement factories in America, their production figures, the steam obtained and the operation of the waste heat boilers. If the figures given for America are correct, the success of the waste heat boilers is so complete that the Germans will not be able to avoid following the example. The Ford plant was also visited. This plant has had a cement manufacturing division for several years. The cement is made by the wet process. Dust difficulties have been overcome—the plant is absolutely dustless. One thousand one hundred barrels of cement are manufactured daily. It should be noted, he said, that dextrin is added to the clinkers in order to produce a favorable effect, it is said, on the opening up of the clinkers. The clinkers are dried in the open.

Growth of Industry in America

With the wet process the total available heat can be utilized in waste heat boilers. The American industry has had a tremendous expansion since 1880. The present annual output is 150,000,000 bbl. Slag, blast-furnace and natural cements are avoided in America. The 10 largest American cement mills produce more than one-third of the total production. The introduction of the wet process is favored because it frees the operations from troublesome dust. Advances have been made in grinding practice, and multi-stage mills are generally used. The power consumption of the grinders is less than in German practice, but the grinding is somewhat coarser.

Especial attention has been devoted in America to the rotary kiln. Together with small kilns 40 to 60 ft. long, there are others 260 ft. long. The fuel generally used is coal, also coal and gas and oil and gas. The use of oil alone has increased considerably in the West. A third of the American mills are equipped with waste heat boilers which furnish 70-100% of the total power requirements. There has been considerable discussion as to whether horizontal or vertical tube boilers should be used, but no conclusion has been arrived at. There is also the use of Fuller pumps for conveying pulverized coal and tests are being made to transport cement considerable distances by the same means. [The use of these pumps for conveying cement has recently been adopted by at least two of the larger American plants.—Ed.]

The silo arrangements in American mills deserve especially attention. There are generally round silos capable of storing one-fourth to one-third of the annual output. Another striking feature of American mills is the use of machine devices even where their cost is greater than for manual labor.

In the discussion which followed, Mr. Schott pointed out that the first tests of waste heat boilers in 1910 gave excellent results. Horizontal tube boilers were used. In a later installation vertical tube boilers were used, but no important difference was noticed. So far as the economy of the wet process is concerned, tests should be carried out on the dry process using waste heat recovery. In the wet process 7 to 9% more coal must be burned than the dry process. Dr. Kuhl pointed out that the large gas volumes produced in the wet process must not be lost sight of. The dextrin used in the Ford cement plant to render available furnace clinkers by the wet method has as its function preventing the slime becoming too thick. Dr. Schott stated that although he had formerly been an absolute proponent of the dry process, he was at present inclined to lean toward the wet process. The power consumption in the raw grinding is smaller in the yet process. Dr. Schindler expressed the opinion that the chief advantage of American practice was the smaller power consumption, as the American plants are very rationally designed.

Dr. Riepert of Charlottenburg then spoke on "The Industrial Development of the American Cement Industry." He gave a review of the organization of the American industry and the development of the powerful trade organization, the Portland Cement Association, which has developed uniform specifications for its members. Production has risen from 76,000,000 bbl. in 1910 to 150,000,000 in 1924 and the number of persons employed has actually decreased. The German production for 1924 did not reach 60% of the 1913 production. In America the war caused a stagnation in construction, but a new and large demand for cement arose for road building purposes due to a marked preference for concrete roads. In the last year road building accounted for 30% of the total cement production. The course of prices showed a marked drop in the crisis years 1910 and 1911 and a similar drop in 1915 when sales difficulties arose, but otherwise the course of prices has been steadily upwards. The prices showed a marked increase on the entry of the United States into the war, perhaps assisted by the governmental price fixing so that it reached and even exceeded German prices. Even after stabilization, German prices remained lower than American. The maintenance of prices was favored by the development of strong firms, 10 companies in the United States accounting for 62% of the productive capacity. A consideration of the import and export figures shows that imports into the United States which in the first decade of this century reached considerable figures from time to time had almost disappeared by 1910 and have shown up again only in the last few years. Interest in the export markets took place for the first time in the crisis years 1910-12 when the home market diminished. In the pre-war period, the chief exports were to Panama, with Cuba and Canada as the next most important sales outlets. In the past-war period South America was an important American customer until European competition revived. With the approximate figure of 150,000,000 bbl. annually the United States accounts for 36% of the world's production, which is about 240,000,000 bbl. The German share is 6%. To what extent the United States will become a competitor of Germany in the foreign market in Central and South America will depend on the transportation situation, which is certainly not unfavorable to the United States.

American Cement Research

Dr. Haegemann gave a review of cement research in the United States of America. He said that, although the American cement industry is relatively young, it has taken part very greatly in cement research. It is only necessary to mention the names of Newberry, Richardson, Bates, etc. Extensive means for conducting research have been provided by the American association. The association maintains no separate laboratory but conducts its investigations in co-operation with various institutions, particularly with the Lewis Institute in Chicago and the Bureau of Standards at Washington. American standards call only for tensile strength in 1:3 mixtures; compression strengths are not specified but are generally determined. A comparison by the speaker showed that American cements correspond approximately to medium grade German portland cements. High test portland cements were not yet being manufactured. American cements are not so finely ground as the German. If high grade German cements are tested ac-

cording to American and German specifications, values are obtained in excess of the American standards. Thus German high grade cements are also high grade cements in American practice. The speaker then mentioned the American methods of concrete testing, the various institutes which are concerned in cement research work, especially the Department of Agriculture, Bureau of Public Roads in which not only are cement and similar products tested physically and chemically but tests are also carried on cracking and wearing out under conditions approximating actual practice as much as possible.

Use of Pulverized Coal

Dr. Simon of Appeln then spoke on "Technical Advances." He said that combustion of pulverized coal had proved itself eminently adapted to cement burning. In the past year 3,000,000 tons of pulverized coal were burned in boiler plants in America. We are thus not at the beginning of a new development but in its midst. By the use of producer gas we operate at an efficiency of 75% combustion on the grate 80%, semi-gas combustion 90%; we reach in the case of pulverized coal combustion an almost complete burning of the fuel and an efficiency of 95%. There is an added advantage in that low grade fuels can be utilized. Naturally attention must be paid to the design and construction of the boiler. The brickwork must be more carefully built, as the temperatures are higher. The disadvantage of coal dust combustion is the absolute necessity of drying and grinding the fuel, which is possible only in large factories. In spite of the fact that the cement industry is destined to adopt this practice, only a few tests in one plant have been conducted on it in Germany. Under circumstances otherwise favorable pulverized coal combustion can compete with other types of combustion. In the United States progress has been assisted by the work of the Fuller Lehigh Co., especially in the production of Fuller mills and Kenyon pumps, which operate on the air emulsification process. A new dryer has also been built by this company.

Diesel Engines to Run on Powdered Coal

In recent times the use of pulverized coal for Diesel engines has come to be considered and an engine has been built in which pulverized coal can be used without any difficulties whatsoever. A further problem, the speaker said, is the installation of high pressure boilers. Finally, the speaker described the packing system of the Bates Co., which could be recommended for Germany also.

Investigating Cement by Petrographic Methods

Professor Nacken of Frankfurt spoke of the application of Rontgen Rays (X-Rays) to cement investigation. It was sought to determine by numerous investigations which compounds in the cement are responsible for its hydraulic properties. The methods of formation of the various calcium silicates and aluminates were investigated, and the stable and labile modifications prepared. It is noteworthy that a compound $3CaO.2SiO_2.Al_2O_3$ could be prepared beyond a doubt; Professor Paenicke had previously accidentally come across this compound, the existence of which is completely ignored by the Americans. In the investigation petrographic optical methods were invented and used. The author then described in detail the methods of investigation used in crystal analysis employing X-ray gratings. A number of crystals were shown by lantern slides and it was shown furthermore that kaolin gives the spectrum of a crystalline substance. It is to be hoped that by the application of such methods new discoveries will be made in cement research which cannot be obtained by the ordinary petrographic methods.

Dr. Biehl of Langereich i.W. spoke on the petrography of portland cement clinker. He attempted to show how information as to the quality of the resulting cement could be obtained from the clinker in practice by use of the polarising microscope. The question of burning and sintering was studied in the case of a series of shaft furnace and rotary furnace clinkers. The influence of the cooling conditions could be shown as well as of the addition of aids to fusion. These investigations, however, bring out very little concerning the chemical constitution. However, from the structure of the ground mass it can be seen whether little or much iron is contained. This could at least be determined, namely, that quickly cooled clinkers, strongly burned, gave the best cements.

In the discussion which followed it was pointed out that portland cement is a silicate in which the content of silica, lime and alumina may vary greatly and that we must be careful not to speak of alit as a definite compound. We must not expect to obtain sharply defined compounds in a clinker but only groups of minerals. Dr. Kuhl added that alit is not claimed to be a compound, but we must remember that in the many clinker materials which co-exist alongside of each other, typical groups are contained of which we call one which is always prominent in good cement, alit.

Relation Between Expansion and Strength

Dr. Kalk of Hannover spoke on volume increase and water absorption of cements in relation to their density and strength. He reported the results of a series of tests which he had conducted in the chemical section of the engineering laboratory of the technical high school at Hannover. The purpose of the investigation was to determine the density properties of the individual binding components quantitatively and to compare them. He pointed out that we must distinguish between the theoretical physico-chemical density and the practical density; the theoretical depends on the number of cavities; the practical depends on the impermeability to water or its porosity. The researches indicated a relationship between the strength properties of the material and its expansion.

Cement from Oil Shales

Dr. Killig of Degerhamn, Sweden, spoke on the utilization of oil shales in Sweden. He described the use of oil shales to lime burning and to cement manufacture and the occurrences of oil shales in Sweden. The expression oil shale is not really accurate, as the oils are produced in the distillation process. In their original condition the shales contain no oil. The oil shales are utilized chiefly in Sweden, although the Swedish shales are not high-grade. The speaker showed by means of a large number of slides the method of lime burning in Sweden in field furnaces by means of oil shales as well as cement manufacture using the shale residues.

Problems of Testing

Dr. H. Kuhl of Berlin-Lichterfelde then spoke on the problems of cement testing. He desired to consider the problem of cement testing without regard to the problem of cement standards and did not wish his paper to be considered as a proposal to revise cement standards. If the standards are considered, it will be recognized that a certain small range of properties is officially delimited by them. But there is a large range of properties which are not standardized as, for instance, resistance to chemical attack and against mechanical wear. The fineness is included in the standards, but we are approaching the time when the determination of fineness by screen tests alone will no longer be possible. The screening data are no longer comparable if the cements are ground in different types of mills. In order to obtain an insight into the fineness of the cement grain, Professor Gary proposed air separation, but this has not found application in the laboratory owing to the fact that the apparatus has not been sufficiently developed. [The air separation process has been fully developed and is regularly used by the Bureau of Standards.—Ed.] The method proposed by Michaelis for the utilization of the sedimentation method with alcohol is too complicated for use in the plant. Another method for the investigation of the fine particles of cement is indicated in a proposal made by Professor Paneth, according to which the surface of a substance absorbs radioactive substances more strongly the finer the particles of the absorbing substance are. The cement could be shaken up with an alcoholic solution of a radioactive substance and in this way the fineness of the particle determined.

A property not touched on in cement standards is the mechanical wear. Cement

which has high strength properties should also show great resistance to mechanical wear, but this is not always the case.

If blast furnace slag, gypsum and caustic potash are used to make a test piece, this is found to be set after 24 hours dull on the surface and glassy in the interior. In low-lime cements we often have the property of "sanding-off." According to Michaelis, the oxygen of the air oxidizes the reducing components of the slag. The author, however, has found that the carbonic acid of the air and not the oxygen is the cause of the phenomenon. The author then discussed the testing of the setting period and the investigation of the setting process. He considered cooking tests and the relation of strength under compression to tensile strength. The experiments showed that large differences in the strength properties result from variations in the grain size of the sand used. It was pointed out the standard sands used in other countries lead to higher strength figures. A change in the standard German sand, he said, is to be made only after the most mature deliberation, as the statistical data would be rendered worthless for comparative purposes if a new standard is adopted.

Dr. Haegemann then spoke on cement formulas. He considered the various formulae and believes that we can arrive at a formula on the basis of empirical tests. Most investigators have deduced compounds from their formulae. This is a disadvantage because we do not really know what compounds we actually have in cement. The author then discussed in detail the formulas proposed by various investigators and calculated various cements according to these formulas.

New Danish Cement

Finally Engineer Larsen of Copenhagen spoke on novelties in the cement industry in the last 10 years. The improvements introduced into Scandinavian and English cement plants look to simplification of operation. He described with the aid of slides the Kominor-tube mill assembly of Larsen as well as the Unidan mill. The new Unax furnace not only simplifies the combustion but has distinct thermal advantages. Then the Pyrator system was described which combines the drying and grinding into one process. Finally the speaker described Velocement, which shows large strength figures and has the advantages of fused cements. This cement manufactured and developed in Denmark can replace expensive fused cements for every purpose.

Gypsum Building Construction

GYPSUM roofing tile, as the name indicates, is cast at the mill and is used for roofing purposes. However, some types of this tile are made for floor construction. Several standard shapes and sizes of precast roofing tile are available, including:

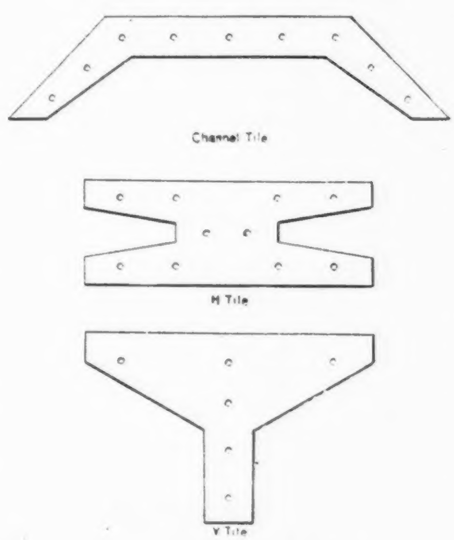
Short Span Tile. These are 30 in. in length, 12 in. wide and either 3 or 3½ in. thick. The 3½ in. tile are cored (hollow) while the 3 in. are solid. They are erected by laying directly on the purlins, which are iron T's. The spaces between tile are filled with gypsum grout.

Long Span Hollow Tile. These tile are similar in shape to the short span tile, but are much heavier, as they are intended to be used on spans up to and including 8 ft. The width of this type tile is 18 in. and it is 6 in. in thickness. Erection is done in a manner similar to short span tile. In some instances to facilitate erection this type and short span tile are cast with lap joints.

Long Span Channel, H and Y Tile. These tile are cast in the shapes indicated in Fig. 1. They are designed for spans of from 4 to 8 ft., are 18 in. wide and 5 or 6 in. in thickness. They are erected by laying directly on the steel or wood framing, the joints being filled with gypsum grout. The Y and H shaped tile are designed for floor construction and when an undersurface is desired which is to be plastered the H shape tile is used.

In order to obtain the maximum strength and minimum porosity, precast roofing tile are cast from "second settle stucco." All types are reinforced with No. 14 galvanized wire of 6x3 in. mesh.

Precast floor tile is also cast at the mill



Forms of roofing tile

and shipped to the place of erection. The size of the units are 19 in. wide by 18 in. long with thickness of 6, 8, 10 or 12 in. The standard shape is as indicated in Fig. 2. This tile is laid directly on the supporting members. The spaces on the upper side are filled with concrete. The lower surface is smooth, offering an excellent base for the reception of plaster.

Poured-in-Place Construction

Two types of poured-in-place gypsum constructions are at present employed, one, the so-called suspension system, has been in use for a number of years, while the other is a comparatively new use of gypsum. In the former the reinforcement employed is not dependent on the gypsum mass for the full development of its tensile strength, but must be secured (independently of the gypsum) to the supporting construction. Before the pouring of the gypsum mix the reinforcement is brought into tension and is temporarily secured to the form work. This condition is maintained until after the mix has been poured and is set. The strength required for the cables is calculated by accepted formulas and depends upon the loading, the length of span and the sag given the cables. The lightness of this type construction is one of its features, weighing 4 lb. per sq. ft. per in. thickness. The composition of the mix used varies somewhat from place to place, but is approximately 85% calcined gypsum, 15% wood chips, excelsior or vegetable fiber by weight. The cables usually consist of two No. 12 twisted galvanized wires spaced 1 to 3 in. on centers.

Wire Mesh Reinforcement

In the other system the reinforcing consists of wire mesh, which is usually No. 6 galvanized wire, 4 in. on centers tied together with smaller wire 12 in. on centers, embedded in the bottom of the gypsum slab, as opposed to the taut cables of the suspension system. The mode of erection is also different in that no formwork is necessary. The supports are iron T's, 32 in. on centers, across which are laid at intervals of 36 in. 1 in. T's. Into these 32x36 in. spaces are placed ⅜ in. plaster board and over the whole is laid the wire mesh, and the gypsum mix poured to the desired thickness. It is claimed by the erectors of this system that when the gypsum sets around the wire mesh any superimposed load brings the reinforcement into tension, thus enabling the gypsum slab to carry the load to the supporting beams.—*John J. Porter in Chemical and Metallurgical Engineering.*

Start Rock Crusher at Osborn, Ohio, Cement Plant

THE Southwestern Portland Cement Co. has started one of its rock crushers at its new plant at Osborn, Ohio, and the industry is well on the way to complete operation. The 190-ft. smokestack has just been completed.

Work is in progress there on the construction of the plant of the Wabash Portland Cement Co. Buildings are assuming proper proportions and will soon be completed.—*Dayton (Ohio) News.*

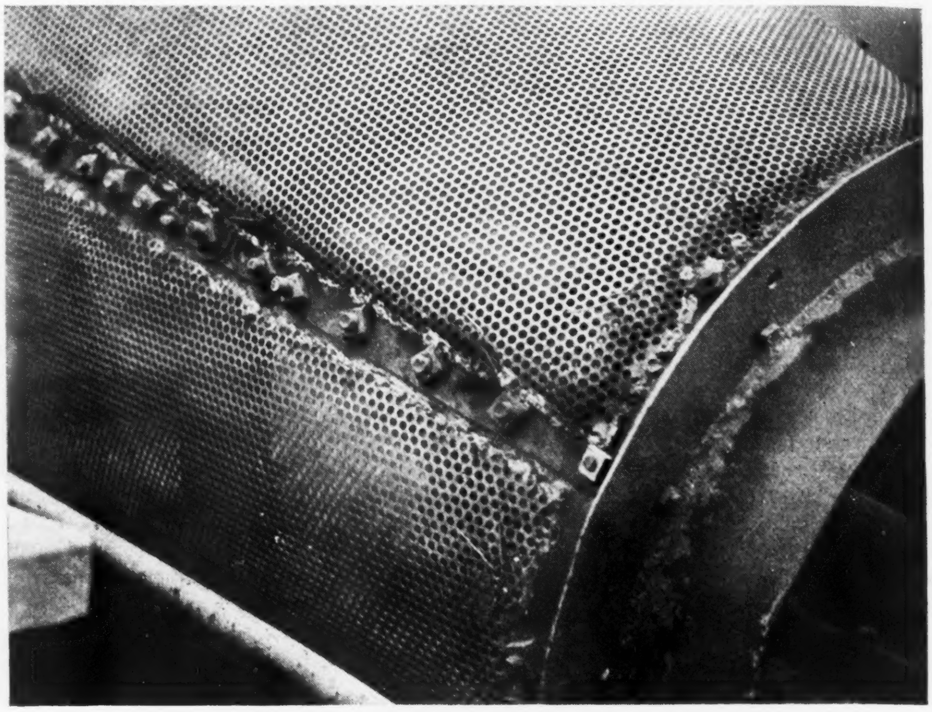
Hints and Helps for Superintendents

Welding in a Screen

THAT welding is cheaper than riveting is well enough known, but it may be new to some readers, as it was to the writer, to learn that welding may be cheaper than bolting and unbolting a bolt-fastened seam. This has been worked out by the Massaponax Sand and Gravel Corp., Fredericksburg, Va., and applied by them in replacing worn screens. The old screen is cut off by a torch near the bolts, leaving a strip fastened to the screen frame. The new screen is trimmed off to fit and welded to this strip. The process takes much less time than unbolting the old screen and bolting on the new one and the result is just as satisfactory in every way.

Screens can be replaced by this method four times. Then the strip that is bolted to the frame will no longer stand welding and an entirely new scren has to be bolted on.

Electric welding is principally used at this plant. It has a portable motor generator set so that current can be had at any part of the operation. There would seem to be no reason why the oxygen-acetylene torch could not be used to do the same work.



The perforated part of the old screen is cut off and the new screen welded to the bolted on strip that is left. This has been found cheaper than unbolting the old screen and bolting on the new

Loading Skips in a Quarry

By J. R. THOENEN

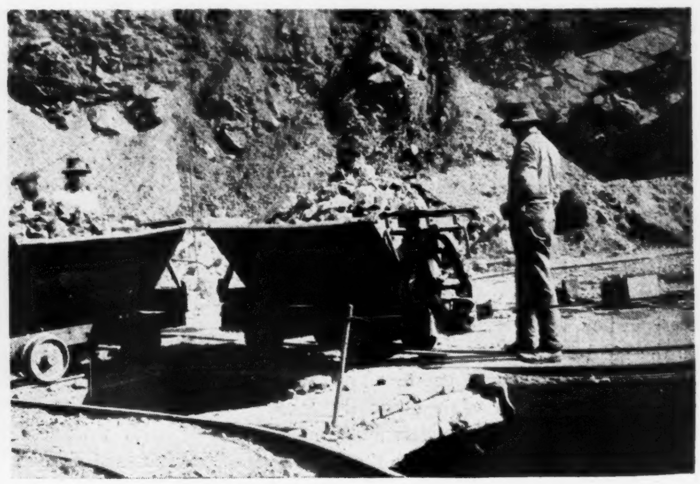
SKIPS are often used with inclined haulage to elevate broken stone from the quarry floor to the crusher although it is more often the case that the car itself is hoisted. A unique arrangement is shown in the pictures whereby the skip enters a depression in the floor of the quarry for loading. The excavation is timbered and covered except for a small opening directly over the skip. Tracks approach the loading point in such manner that a car can dump directly into the skip from each of three sides, thus saving time in switching or the use of a turntable. One picture shows two cars in position to dump at right angles to each other. In wet weather provision must be made to de-water the excavation but a hand pump or bailer is often sufficient.

Scheme for Sorting Clay Lumps from Crushed Stone

By H. L. ALDRICH

Asst. Supt. Sand and Gravel Pit A. of P. Koenig Coal Co., Oxford, Mich.

FOR your page of hints and helps I submit the following "kink" which frees our crushed stone from any clay lumps that escape the washer. Sometimes it remains for the simplest kind of a tool or trick to improve your product 100%. We run our



The skip from the incline goes below the level of the quarry floor. An opening above, with a chute, permits the quarry cars to be dumped into the skip

oversize through a rotary screen into a long chute down to the crusher. Sometimes lumps of clay come over in sizes varying from 2 to 12 in. These very often plugged our gyratory crusher and delayed the game for some time.

To overcome this we installed a gate in the stone chute that could be raised or lowered, stopping all stone for a few seconds. Then we had the blacksmith make up a one tine barbed spear out of a 4-ft. length of ½-in. rod. With this tool a man stands at the gate and spears out all the clay lumps that come down, holding the gate down until the stone is free and clean. Then he raises the gate and lets the material into the crusher.

This is only a very simple kink, but we worked out last year without having thought of it, and it was my idea in giving it to you that it might be of use to some other operator. Our stone has been free of clay ever since we installed this and it costs us nothing additional, as the work is done by our crusher man who we had to have on the job anyhow.

A Good Sand Washing Device

SAND in some localities has to be thoroughly washed to make it fit for use as fine aggregate in concrete. This is especially true where organic matter is present, as is the case in many deposits along the Atlantic coast in the southeastern states. In general, this organic matter is with the clay and loam that is found with the sand in the deposit, and the clay and loam adheres as a film to the grains of sand. Simply passing through one water after another will not remove the organic matter sufficiently. There has to be some scrubbing action and a number of contacts between the grain and fresh water in order to remove it.

The picture shows a sand washing device that has proven very successful at the plant of the Massaponax Sand and Gravel Corporation, Fredericksburg, Va. It was designed by Geo. M. Davis, who is secretary of the company and has also had much to do with the design and operation of the plant.

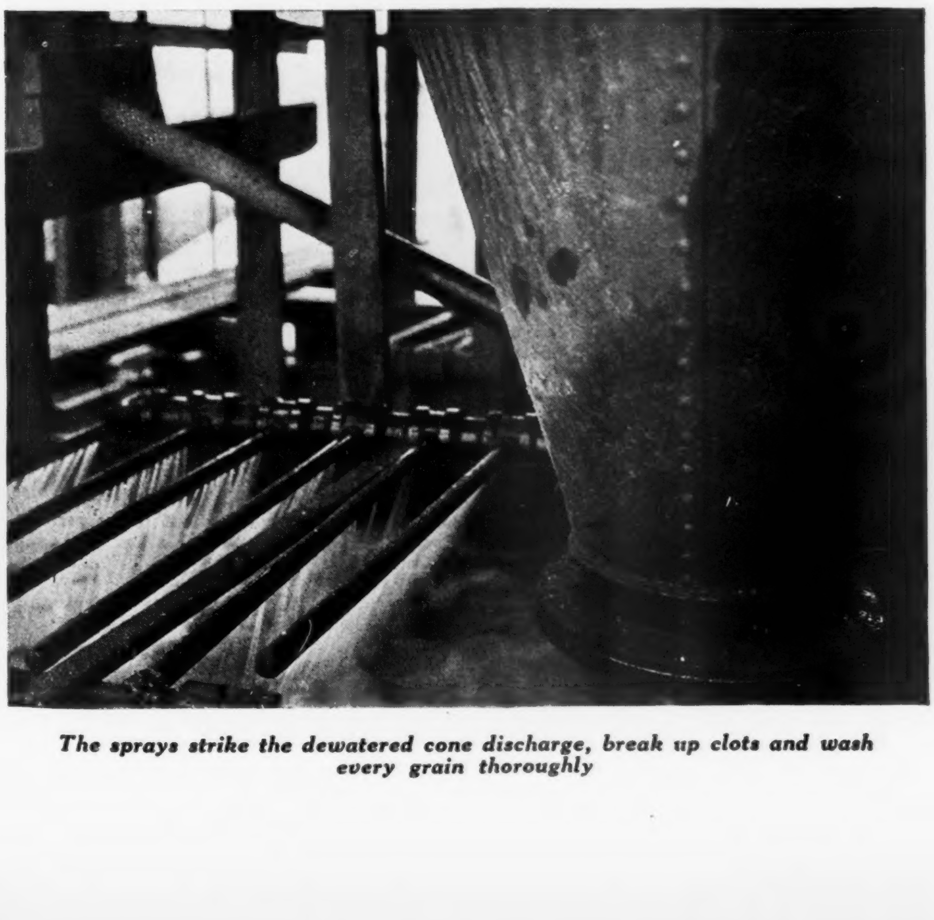
The sand is first collected and dewatered by a Dull cone. This removes practically all of the clay and loam, except that adhering as a film to the grains of sand and a little that is contained in the voids of the sand. The discharge of the Dull cone falls into a trough about 4 ft. wide. Across this trough are a number of spray pipes with ⅛-in. holes from which the water issues with considerable force.

The sprays break up the clots of sand and turn the grains over and over. The whole of the sand and water in the trough is in violent agitation and one can see that the grains are thoroughly separated and that each is brought in contact with fresh water so that all the clay film is removed.

The trough is rather flat and the jets are set with a slight angle from the vertical so as to urge the sand and water forward as well as wash it.

The sand flows from this trough into a second Dull cone by which it is dewatered and it is then run either to a bin or a stockpile.

The sand produced by this company has a very good reputation as fine concrete aggregate and the reason is the thorough washing and scrubbing given by this device.

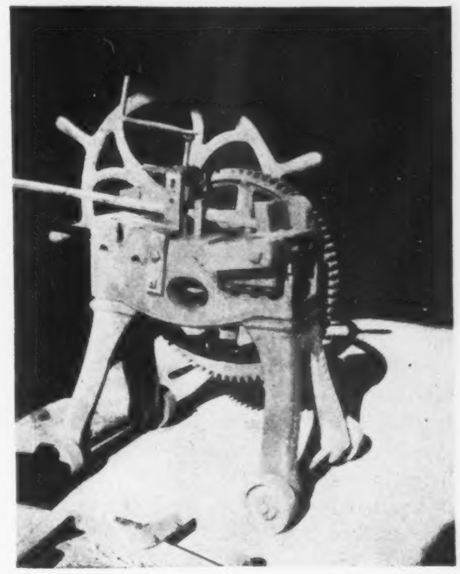


The sprays strike the dewatered cone discharge, break up clots and wash every grain thoroughly

Device for Forming Lugs on Hollow Steel

By J. R. THOENEN

THE picture shows an old tire bender drafted into renewed use as a device for forming lugs on round hollow steel. After heating, the steel is clamped into place over the dies by the simple screw clamp shown strapped over the center of the frame. The end of the steel is then forced back and the hot metal into the dies by means of the hand wheel and winch of the tire bender. The dies are shown just in front of the drill clamp. Only that part of the drill which is to form the lugs need be heated and no mechanical power is needed.



Tire bender used for forming lugs

Stopping the Little Losses

A BIG saving can still be made by eliminating the little losses, and practicing economy in the use of small supplies that are classified as expense material, such as oil, cotton, waste, brushes, emery and sand paper, rubber hose, paint, coal and fuel oil, cutting and welding supplies, acetylene gas, oxygen, electrodes, carbon, brick, and miscellaneous supplies. All these seem like small items, but when their cost is totaled for a year it is surprising to note the enormous amount of money expended for them.

Other small items of expense such as bolts, nuts, rivets, screws, and washers will sometimes become mixed and a miscellaneous assortment will accumulate upon the floor. Such accumulations are too commonly looked upon as junk and treated accordingly, and eventually find their way to the scrap pile.

Above the skyline of New York City stands the tower of the Woolworth building, and in Chicago the Wrigley building stands out supreme among all others. Both of these impressive structures were built by nickels. —*Marion Excavator.*

Deep Hole Quarry Drilling With Hammer Type Drills

By Joseph A. Walshe
Denver Rock Drill Mfg. Co.

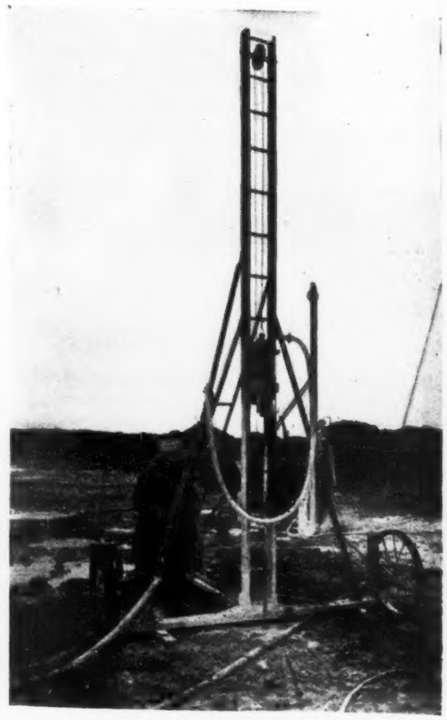
UNTIL 1915 the heavy mounted hammer drill was practically unknown as a machine for deep hole quarry drilling, but in that year, the Denver Rock Drill Manufacturing Co. introduced its Model 60 "Dreadnaught," for drilling holes up to 20 ft. in depth. This type of machine was found especially adapted for drilling limestone in quarries. For this class of work it was usually mounted on either tripods or quarry bars, and 1¼-in. round hollow steel was used. The cuttings were cleaned from the hole by means of a by-pass, admitting air through the hollow steel.

In 1917 the Model 21 "Turbro" drill, manufactured by the same company, was found to be even more successful as its independent rotation of the drill steel made it especially adapted to broken formations. Another advantage was its ability to drill holes to greater depth, and there are many in use today drilling up to 30 ft. in depth. The method for cleaning the hole is the same as with the other machine. With the "Turbro," the footage figures show that 218 ft. have been drilled per 10-hour shift, finishing the holes at 2 in. diameter. In one quarry having a 20 ft. face, and where many tests were conducted with various type drilling outfits, five Model 21 "Turbro" machines are producing approximately 3000 tons of stone per day, or 600 tons per drill per shift. In this quarry the holes are spaced on 8 ft. centers, and by distributing the powder, using both 60 and 40% explosive, the approximate drilling and blasting costs are 25 cents per ton of broken stone, which includes labor, compressed air, blacksmith, and accessories such as steel, hose, etc.

The powder consumption is between ½ and ¾ of a pound per ton of broken stone. With this method of spacing holes and blasting, there is little secondary drilling required.

In 1924 a simple portable derrick rig was designed which greatly increased the utility of the hammer drill in the quarrying field, particularly in limestone and similar free cutting formations.

Raising the drill



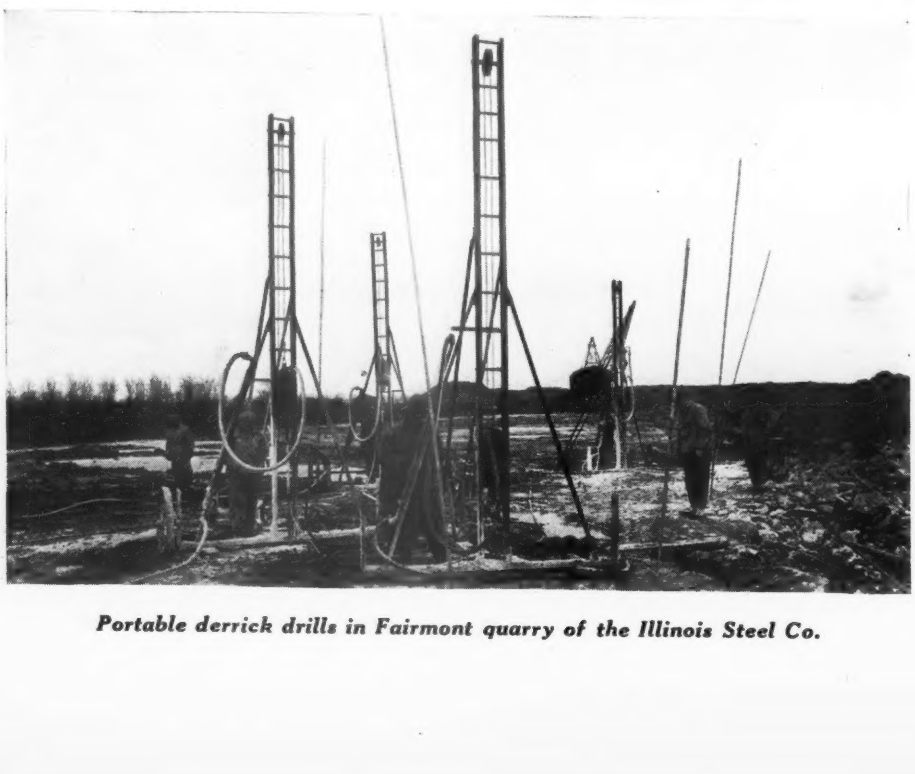
The air valve on the diagonal bracing

The details of the derrick rig are shown in the accompanying pictures. It is of light angle iron about 16 ft. high. The vertical uprights are guides for the mounting slide to which the rock drill is attached. Two winches are provided, one for raising and lowering the rock drill, and the other for removing or inserting the drill steel.

One operator has increased the mobility of the rig by adding wheels, and has further improved it by clamping a piece of pipe on the diagonal bracing. To this piece of pipe the air line is connected on the lower side, a throttle valve is conveniently placed and sufficient air hose attached between the upper end and the rock drill to allow the latter full vertical travel.

The use of the derrick simplifies vertical deep hole drilling. Gravity feeds the machine, and where the rock is free cutting and non-abrasive, eight to ten feet of hole is secured with each steel change. One company, using 1¼-in. round hollow steel, starts with an 8 ft. length of drill steel, 2⅝-in. diameter bit. The second piece of drill steel is 16 ft. in length, 2½-in. bit. The third 24 ft. long, 2⅜-in. bit, and the holes finish at 2 in., 36 ft. in depth. In this operation the holes are cleaned through the use of an auxiliary ½-in. air line directly connected to the back head of the machine, and having a valve located in the air line. By this device the operator can direct at will a powerful jet of air through the drill steel to the bottom of the hole.

In working a Mississippi limestone ledge with a 25 ft. vertical face, the row of hammer drill holes in one instance is started eight feet back from the face. The close spacing gives excellent fragmentation, minimizes the possibility of toe and the neces-



Portable derrick drills in Fairmont quarry of the Illinois Steel Co.

sity for secondary drilling, and avoids the possibility of "back breaking." In this case, the powder consumption per ton of broken rock is very moderate. Over 200 lineal feet per drill per shift is secured.

The success of the drills mentioned in the quarrying field, led to the same application of the Model 34 "Turbro" in 1924. This machine is more powerful. Its possibilities have not yet been thoroughly developed, but it is certain that it can be economically and efficiently applied to primary drilling in a majority of open pit quarrying operations. Perhaps the best criterion of its performance will be obtained by citing a case taken from a limestone project. Using the derrick rig, the overall footage per shift is around 200 ft., average depth of hole 40 ft., diameter at bottom, 3 in. Ten-foot steel changes are used. Although the overall footage is the same as cited for the Model 21, the important fact must be noted that with the Model 34 a 40 ft. hole is bottomed at 3 in. diameter, while with the Model 21 a 36 ft. hole is bottomed at 2 in. This gives the latter model a power rating over three times as great as the former. Drilling 3-in. bottom diameter, the holes in this case are spaced 10 ft. to 20 ft. from the face, approximately 3 ft. apart, and excellent fragmentation is secured.

In quarrying with hammer drills, it is obvious that no set rules can be laid down as to the spacing of the holes either as regards distance from the face or distance between centers. These measurements must be modified to suit the character of the ground and the height of the face.

Summing up, it is safe to say that the use of the hammer drill for open pit quarrying operations has outstanding features in its favor. The initial cost is less. The operating expense is lower. The drilling speed is faster and much closer spacing of holes can be made, giving a more uniform distribution of explosive, better fragmentation, and less secondary drilling.

This type of drill is especially adapted to those quarries near large towns in which heavy blasting is prohibited by the nearness of houses and other buildings.

Fluorspar in 1924

THE shipments of fluorspar in 1924, as shown by a statement given out by the Department of the Interior compiled by Hubert W. Davis of the Geological Survey, amounted to about 124,914 short tons, valued at $2,453,950, an increase of about 3% in quantity but a decrease of about 2% in total value as compared with 1923. The reported average selling price f.o.b. mine shipping point decreased from $20.68 in 1923 to $19.65 in 1924. Colorado and Kentucky were the only states that recorded an increase in 1924. The shipments of fluxing grade fluorspar to steel plants and foundries showed an increase of about 11% in 1924, but the shipments of the higher grades of fluorspar recorded a decrease of about 28%. The stocks of fluorspar at mines or at shipping points at the end of 1924 amounted to about 69,000 short tons. These stocks consisted of about 28,900 tons of crude fluorspar (which must be milled before it can be marketed), 32,400 tons of gravel fluorspar, 6600 tons of lump fluorspar and 1100 tons of ground fluorspar.

The imports of fluorspar into the United States in 1924—51,043 short tons, the largest quantity ever imported—were equivalent to about 41% of the domestic shipments of fluorspar, as compared with 35% in 1923. England, the principal source of the imports, supplied about 49% of the total. The value of the foreign fluorspar averaged $10.89 a ton in 1924. The cost to the consumers in the United States includes in addition to the duty of $5 a ton, the ocean freight charges, the cost of transporting the fluorspar from the mines to the docks, loading charges at the docks and other small charges.

The producers of about 94% of the basic open-hearth steel that was made reported that they consumed 111,419 short tons of fluorspar in 1924 and had stocks on hand amounting to 60,207 short tons on January 1, 1925. If the steel companies that did not report consumed a like proportion of fluorspar, the figures given indicate a total consumption in all steel plants of about 118,500 tons in 1924 and total stocks of about 64,000 tons on hand January 1, 1925. The total consumption of fluorspar by steel plants in 1923 was about 138,000 tons, and the total stocks on January 1, 1924, were about 49,900 tons. The consumption of fluorspar per ton of steel produced in 1924 averaged 7.8 lb., as compared with 8.1 lb. in 1923.

The accompanying tables show details of the fluorspar statistics for 1924. The figures for 1923 are final, but those for 1924 are subject to slight revision.

FLUORSPAR SHIPPED IN 1923 AND 1924, BY STATES

	1923			1924		
	Short	Value		Short	Value	
State	tons	Total	Average	tons	Total	Average
Illinois	65,045	$1,443,490	$22.19	62,067	$1,288,310	$20.76
Kentucky	45,441	945,402	20.81	47,847	988,940	20.67
New Hampshire	142					
Utah	188	6,356	19.26			
Colorado	6,044	59,710	9.88	*15,000	*176,700	*11.78
New Mexico	4,328	50,861	11.75			
	121,188	$2,505,819	$20.68	*124,914	*$2,453,950	*$19.65

*Approximate and subject to revision.

FLUORSPAR SHIPPED IN 1923 AND 1924, BY USES

	1923 (final)			1924 (approximate)		
	Short	Value		Short	Value	
Use	tons	Total	Average	tons	Total	Average
Steel	96,713	$1,762,602	$18.23	104,284	$1,851,892	$17.76
Foundry	3,748	79,452	21.20	7,138	159,533	22.35
Glass, enamel and sanitary ware	10.768	389,515	36.17	9,565	335,243	35.05
Hydrofluoric acid	6.976	210,596	30.19	3.150	89,413	28.39
Miscelloneous	1,839	38,342	20.85	160	3,380	21.13
Exported	1,144	25,312	22.13	617	14,489	23.48
	121,188	$2,505,819	$20.68	124,914	$2,453,950	$19.65

FLUORSPAR IMPORTED INTO THE UNITED STATES IN 1923 AND 1924, BY COUNTRIES*

	1923			1924		
	Short	Value		Short	Value	
Country	tons	Total	Average	tons	Total	Average
Belgium	35	$712	$20.34	6	$75	$12.50
British South Africa	10,380	157,625	15.19	10,585	134,959	12.75
Canada	(†)	5	....	213	3,216	15.10
China	90	1,183	13.14	506	5,089	10.06
England	22,862	202,548	8.86	25,261	254,969	10.09
France	....	....	....	970	9,643	9.94
Germany	8,580	67,595	7.88	9,924	104,189	10.50
Italy	268	2,471	9.22	1,585	14,804	9.34
Netherlands	11	180	16.36	1,177	13,951	11.85
Portuguese Africa	....	....	....	540	13,018	24.11
Scotland	....	....	....	276	1,729	6.26
	42,226	$432,319	$10.24	51'043	$555,642	$10.89

*Figures compiled from records of Bureau of Foreign and Domestic Commerce.
†Quantity not recorded.

Catalytic Effect of Calcium Chloride

THE chemical and physical phenomena involved in the setting and hardening of portland cement are not completely understood. However, the hydrolytic action of gauging water decomposes the calcium and aluminum silicates liberating lime and a mixture of colloidal compounds of silica and alumina. The lime is immediately hydrated and crystallized with some evolution of heat, while the colloids swell into a gelatinous mass and undergo dessication as the crystallized lime is absorbed by them. The effect of calcium chloride is to speed up the reaction, although the exact chemistry involved is not clear. Since only 2 or 3 lb. of calcium per 100 lb. of cement are required to produce a very marked effect, it would appear that the calcium does not react directly with the cement constituents but functions rather in the capacity of a catalyst. —*Chemical Record-Age.*

Gypsum and Gypsum Products

Brief Account of the Natural Forms of Gypsum and a List of the Principal Manufactured Products

GYPSUM is one of the most ancient of building materials. The Greeks were users of gypsum during the time of Pliny, whose writings of ancient history (23-79 A. D.) are contained in 36 books. Book XXXVI, dealing with different kinds of non-metallic minerals, includes reference to gypsum. This naturalist also minutely describes the removal of a beautiful gypsum plaster frieze from Lacedaemon to adorn a public building in Rome. Going further back, the Temple of Apollo at Bassae, built 400 B. C., affords an excellent example of the use and permanent structural qualities of gypsum. The great pyramids of Egypt (1580-1350 B. C.) contain plaster work of gypsum executed nearly 4000 years ago.

For a further research on the history of gypsum refer to the following:

Iowa Geological Survey, Volume XXVIII, Annual Reports, 1917-1918, pages 185 to 199, by Dr. F. A. Wilder.

United States Geological Survey, Bulletin 697, page 33, Gypsum Deposits of the United States, by R. W. Stone and others, 1920.

South Australia Department of Chemistry, Bulletin 7, page 9, Gypsum and Plaster of Paris, by D. C. Winterbottom.

Geology

Gypsum is abundant in Europe, Asia, Australia, Canada, Alaska, some of the South American republics, and the United States. In its native state this mineral varies considerably in appearance and physical characteristics, depending upon the presence or absence of crystalline structure, crystalline form and color, and for these reasons has been given the following names: rock gypsum, gypsite or earth gypsum, gypseous shales, selenite or transparent gypsum, radiated and plumose gypsum, fibrous and satin spar gypsum, snowy and alabaster gypsum, also anhydrous gypsum.

The raw or uncalcined gypsum and gypsite, from which gypsum products commonly used in building construction are manufactured, is produced at mines or quarries located in the following states: Arizona, California, Colorado, Iowa, Kansas, Michigan, Montana, Nevada, New Mexico, New York, Ohio, Oklahoma, Oregon, South Dakota, Texas, Utah, Virginia, Wyoming, and in Alaska. It is also imported from Nova Scotia, New Brunswick and Ontario, Canada. The states of New York, Michigan, Ohio, Iowa and Texas produce the greatest tonnage, in about the order named. At this time the annual production of gypsum in the United States is about 4,000,000 short tons.

Commercial gypsum is found in beds varying from less than a foot up to several hundred feet in thickness.

Chemistry

Gypsum is hydrous crystalline calcium sulphate (the sulphate of calcium with two molecules of water of crystallization in chemical combination), and is expressed chemically as $CaSO_4+2H_2O$. It contains, when pure, 79.1% of calcium sulphate ($CaSO_4$) and 20.9% of water (H_2O).

THIS is reprinted from the advance proofs of Gypsum, a Non-Metallic Mineral, a treatise by Virgil G. Marani, chief engineer of the Gypsum Industries. It is reproduced here because it contains so many important facts about gypsum in a condensed form.—The Editors.

Gypsite, or earth gypsum, is gypsum rock in a very fine state of division scattered through fine clay or loam so abundantly as to form 80 to 90% of the entire mass. It occurs in several of the Western states in deposits of varying thickness, and is of considerable economic importance.

Physical Characteristics

As affecting products used in the construction of buildings, the following are the most important physical properties of gypsum:

Hardness—Based on Mohs' scale, in which talc, the softest mineral, is 1, and the diamond, the hardest, is 10, the hardness of gypsum rock (not calcined) is placed at 1.5 to 2.5.

Color—Generally white or a pearly gray. Also in light shades of pink, yellow, brown, blue, and sometimes even black.

Luster—Generally classified as a mineral without luster. Selenite, which is a large crystalline form of gypsum, has slight moonlike reflections.

Odor—None.

Specific Gravity—As compared to an equal volume of pure water, the weight of gypsum rock (not calcined) is placed at 2.3 to 2.4.

Weight—The following are sufficiently close approximations of the average weight of gypsum rock, and plaster of paris which is gypsum rock after being calcined:

	Weight per cu. ft., lbs.
Gypsum Rock: (Solid, not calcined and dry)	140 to 145
Gypsum Rock: (Crushed, not calcined and dry, all to pass a 1-in. ring)	80 to 90
Gypsum Rock: (Ground, not calcined and dry, 80% to pass 100-mesh screen)	70 to 80
Plaster of Paris: (Ground rock calcined, 80% to pass 100-mesh screen and shaken)	60 to 80
Plaster of Paris: (Rehydrated, set and dried out)	72 to 77

For a further research on the geology and properties of gypsum refer to the following:

Iowa Geological Survey, Volume XXVIII, Annual Reports, 1917-1918, pages 63 to 184, by Dr. F. A. Wilder.

United States Geological Survey, Bulletin 697, pages 15 to 32, by R. W. Stone and others, 1920.

Manufacture

Gypsum rock, when quarried or mined, is crushed, dried and ground to fine powder. This finely ground product is transferred to storage bins from whence it is conveyed to kettles or rotary kiln calciners where it is subjected to heat and, during the process of calcination, is kept in constant agitation. The partial dehydration of ground gypsum rock by properly controlled physical processes yields calcined gypsum sometimes termed plaster of paris or stucco.

Gypsum, or gypsite, which has been partially dehydrated by means of heat, is expressed chemically as $CaSO_4+\frac{1}{2}H_2O$.

It is the method of calcination employed, and the degree to which such calcination is carried forward, that determines the possibilities and uses that the calcined product may be applied to in the field of building construction.

For a further research on the manufacture of calcined gypsum, machinery employed, etc., refer to the following:

Iowa Geological Survey, Volume XXVIII, Annual Reports, 1917-1918, pages 189 to 194, and 227 to 244, by Dr. F. A. Wilder.

United States Department of the Interior, Bureau of Mines, Technical Paper 155, pages 12 to 35, by R. W. Stone, 1917.

South Australia Department of Chemistry, Bulletin 7, pages 42 to 57, by D. C. Winterbottom.

Canada Department of Mines, Publication No. 245, pages 119 to 141, by L. H. Cole, 1913.

Gypsum Building Products

From finely ground or disintegrated gypsum, which has been calcined to the proper degree, the following are the most

important building products manufactured, listed in about the order of tonnage used:

(1) Gypsum Plasters

(a) Gypsum Neat Plaster, viz., unsanded gypsum plaster. Fibered or unfibered. (Sanded on the job.)

(b) Gypsum Wood-Fibered Plaster. (With or without sand.)

(c) Gypsum Ready-Sanded Plaster. Fibered or unfibered. (Sanded at the mill.)

(d) Gypsum Plaster for Concrete Surfaces. (Specially prepared.)

(e) Gypsum Tile or Block Plaster. Fibered or unfibered. For the manufacture of gypsum tile or blocks, slabs, etc.

(f) Gypsum Floor and Roof Plaster. For the fireproof fill in reinforced suspension system floor and roof construction.

(2) Gypsum Finishing Plasters

(a) Gypsum Prepared Finishing Plaster. (Trowel and sand float finishes.)

(b) Gypsum Gauging Plaster. (Retarded or unretarded.)

(c) Gypsum Molding and Casting Plaster.

(d) Gypsum (Keene's) Cement Plaster.

(3) Gypsum Boards

(a) Gypsum Plaster Board. For lath, furring, sheathing, fire stopping, sound deadening, etc.

(b) Gypsum Wall Board. For the finish of walls, partitions and ceilings in the interior of buildings.

(4) Gypsum Tile or Block

(a) Gypsum Partition Tile. For fireproof non-bearing partitions.

(b) Gypsum Furring Tile. For incombustible furring.

(c) Gypsum Fireproofing Tile. For the fire protection of steel columns, trusses, girders and beams.

(d) Gypsum Enclosure Tile. For fireproof stairway, elevator and vertical shafts.

(e) Gypsum Roof Tile (Reinforced). For fireproof and incombustible construction.

(f) Gypsum Floor Void Tile. For fireproof construction.

(g) Gypsum Floor Tile (Reinforced) For fireproof construction.

Also the following, which include some of the most important uses of uncalcined (raw) or calcined gypsum for industrial purposes:

Manufacture of Portland Cement.
Manufacture of Plate Glass.
Agricultural Gypsum (Land Plaster).
Dental Plaster.
Surgical Plaster.
Pottery Plaster.
Terra Cotta Moulding Plaster.
Pipe Covering Stucco.
Foundry Core Stucco.
Paint, Blueing and Cloth Filler.
Manufacture of Crayons, Matches, etc.
For Statuary and other works of art.

British Comments on Lime-Kiln Refractories*

Discussion of European Experience with Various Linings and of Their Defects

By Alfred B. Searle
Consulting Adviser to the Lime, Cement and Clay Products Industries

THE LINING OF THE KILN is one of the most important parts, as unless it is carefully selected and properly constructed, the wear and tear may be very heavy and the consequent repairs very costly; to obtain the maximum durability, suitable lining bricks or blocks must be chosen.

The chief actions to which the refractory lining of a lime kiln is subjected are:

(1) The abrasive action of the descending charge of stone and lime.

(2) The sudden changes of temperature occasioned by draughts of cold air entering the kiln, especially after poking the charge.

(3) The chemical action of the fuel, dust, ashes and gases on the lining.

(4) The chemical action of the lime on the lining at high temperatures.

The results of these various actions are most severe when a very pure lime has to be burned, as this requires the highest temperature and one at which the lime is most corrosive. Impure limes (such as those from the Lias formation) and magnesian limes are burned at lower temperatures and have a much smaller corrosive action on the lining, magnesia being a much less powerful flux than lime and the slag it produces is much more viscous and less penetrative.

The upper part of the lining of a vertical kiln does not present much difficulty, as the temperature is not high and the chief actions to be resisted are the abrasion of the desecnding charge and the deposition of carbon from the waste gases which tend to accumulate in the pores of the bricks and disintegrate them.

Resistance to Abrasion Chief Requirement of Top Lining

Hard blue bricks such as are used for paving and structural work are very suitable for the upper portion of lime kilns, as they are very strong and resistant to abrasion, and are not affected by heat up to about 900 deg. C. Fireclay brick are suitable if hard and of fine texture, they need not be highly refractory. Other materials which are also suitable are granite and hard sandstone, though these are not usually available at a sufficiently low price and are seldom used. A lining of steel plate ¼-in. thick is used in the uppermost 6 ft. of some tall kilns and is very effective.

Some limestones are so little affected by a moderate rise in temperature that the upper part of the kiln may be built and lined with blocks of this material, but most limestones flake and spall when heated irregularly, and a kiln built of such stone would rapidly "wear away."

These materials (with the exception of fireclay bricks) should not be used too far down the shaft or they may be damaged if the fire rises a little too high. The thickness of the lining in the upper part of the kiln need not be more than 9 in. and it may be backed with 9 in., 14 in. or 19 in. of common red brick or second grade fire-bricks with or without a ring of porous bricks to reduce the loss of heat by radiation.

Fire-Zone Linings

Fireclay bricks are most generally used for lining the hottest zones of lime kilns, the best bricks being those which are very high in alumina (about equal proportions of silica and alumina being most satisfactory), as highly aluminous bricks are less readily attacked by lime than are ordinary fireclay

*Chap. VI in a series of articles now running in *The Stone Trades Journal* of London, England. To be republished in book form under the title "Limestone and Its Products."

bricks. It is theoretically incorrect to use an acid lining in contact with a basic material, such as lime, but if aluminous bricks are employed the chemical action is reduced to a minimum. Siliceous fireclay or fireclay-grog bricks are less satisfactory, but are very largely used.

The temperature in the hottest zone of a lime kiln seldom exceeds about 1200 deg. C. and 900 deg. C. to 1000 deg. C. is more usual, so that the refractoriness of the bricks need not be very great, provided they will withstand continued heating at the maximum temperature of use. The bricks must not be highly vitrified and dense, or they will not be resistant to sudden changes in temperature, but it is very desirable that the superficial skin should be dense, in order that it may be as resistant as possible to abrasive and chemical action. Soft, porous-faced bricks are quite useless, no matter how heat-resisting may be the clay from which they are made. A common mistake is to use bricks made from a material containing too much raw clay so that the bricks are lacking in strength and resistance to corrosion. It is well known that a No. 2 grade of firebrick may, by reason of its greater hardness and strength, be often better able to withstand the abrasive action of lime than more refractory, yet softer bricks. Second-grade bricks usually have the further advantage of a smoother and closer face, which reduces the intensity of the action of the lime.

Silica bricks are sometimes used for lining lime kilns, but they are seldom so satisfactory as fireclay bricks, as they are more rapidly attacked by the lime, are friable and not resistant to sudden changes in temperature.

Sandstones and schists have been used with fair satisfaction for lining lime kilns, provided they are placed so that the laminations are horizontal and not vertical; if placed in the latter position, they will readily spall in use. Linings made of natural stone are not constant in volume and the strains to which they are subjected are very liable to disintegrate them, so that such linings are not really economical, even when they are cheaper in first cost. Brick linings are invariably preferable.

Magnesia bricks are unsuitable for lining lime kilns, for although they are basic and not likely to be corroded by the lime, they are not resistant to abrasion at high temperatures, and they are very susceptible to sudden changes of temperature. Moreover, the presence of magnesia in lime used for fluxing purposes is very objectionable. Magnesia bricks are also very costly so that other less resistant bricks are more economical at present, though if a sufficiently hard and strong magnesia brick could be produced at a reasonable cost it would form an almost ideal lining for many lime kilns.

Rammed or tamped linings have been used to some extent for lime kilns, but they are unsuitable on account of their low durability.

Blocks Preferable to Brick

Blocks are preferable to bricks for lining kilns, as there are fewer joints, and as the joints are more easily abraded and corroded than the solid bricks or blocks the durability of a lining built of blocks is greater than one of bricks. Blocks are more costly to buy, but are well worth the extra cost on account of the lesser cost of repair.

Blocks of convenient size are 9, 12, 18 or 24 in. in length, the ends being 9 in. square; they are set as "headers" in the kiln. Larger blocks are inconvenient to handle and so are undesirable. The bricks should also be tapered to suit the diameter of the shaft, so as to ensure their joints being as thin as possible. It is also an advantage to use bricks or blocks with faces curved to suit the cylindrical or oval interior of the kiln; ordinary firebricks, being straight, form a series of projections or hollows which are one cause of the rapid wear and tear of the lining. The small additional cost of properly shaped blocks or bricks is more than counterbalanced by the greater durability of the lining in which they are used.

Whichever kind of bricks or blocks are used for the lining, it is important that they should be accurate in size and shape, as thin joints are imperative. No bricks or blocks —no matter how refractory—will remain long in use in a lime kiln, if they have been laid with wide joints, for the lime readily attacks the jointing material and, a short time after, the firebricks fall out in consequence of the abrasive action of the descending charge.

The refractory lining of the hot zone should not be less than 9 in. thick and, in some cases, it is made as much as 24 in. thick, though this is not generally necessary. It should be backed by inferior firebricks and common building bricks, so as to make a total wall-thickness of 3 ft. or 3 ft. 6 in. if a steel casing is employed, or by a greater thickness of firebricks with concrete or masonry, if no steel is used.

The refractory lining of the kiln should extend about four-fifths of the distance from the bottom of the burning zone and about half-way down the cooling zone. Too long a refractory lining is preferable to one which is too short, as, in the latter, corrosion will be excessive. For this reason, some lime-burners line the kilns throughout with refractory bricks or blocks.

Metal linings are sometimes used in lime kilns, as in the Stein kiln which is built of cast iron sections, each 18 in. high, fitted with projections so as to increase the strength of the shaft, and also the radiation of heat in order to obtain a cool kiln in which the descending column will not be likely to "stick." Such kilns are very wasteful in fuel and very costly to repair, so that they are now very seldom used.

Other linings are sometimes used. Thus, in the Schneider kiln a layer of crushed limestone mixed with tar is used to protect the lining of the kiln, but it is not entirely satisfactory.

Insulation

Insulating the Kiln—In order to prevent excessive loss of heat by radiation, it is often desirable to insert a ring of insulating bricks (made of kieselguhr) between the lining and the outside walls of the kiln. Some kiln builders prefer a ring of loose kieselguhr, or even an empty (air-) space between the brickwork and the steel casing, or between the inner and outer brickwork. It has been found in America that a ring of Sil-o-cel bricks (4½ in. thick) between the lining and the outer wall of a kiln will effect a saving of 60 to 70% of the heat which would otherwise be lost by radiation, or 8 to 9% of the total fuel consumption of the kiln, as well as providing an elastic backing to take up the strains due to changes in the volume of the lining.

The insulation of a kiln reduces durability of the refractory lining because the lining of the kiln is much hotter than when no provision is made for preventing losses by radiation, and, consequently, the chemical action between the lime and the lining is increased. It is, therefore, necessary to take special care to use a more refractory lining in insulated kilns, or the saving effected by the insulation will be counterbalanced by the extra cost of repairs to the lining.

Cement Rate Case Dismissed

DISMISSAL of the complaint in No. 16197, Atlas Portland Cement Co. vs. Northampton & Bath et al., has been recommended by Examiner Warren H. Wagner on a finding that rates on cement, shipped in May and June, 1922, from Navarro, Penn., to Dunraven, N. Y., were not unreasonable and that the record did not support a finding of damage resulting from alleged violation of section 4 of the act. Charges were assessed on the basis of combination of 16 cents to East Branch, N. Y., and 10 cents beyond.—*Traffic World*.

Mechanical Underground Loading

THOSE who operate limestone and gypsum mines will be interested in a bulletin which has been issued by the Department of the Interior and the Missouri School of Mines, co-operatively. It is by Charles E. Van Barneveld, mining engineer of the Bureau of Mines. It is sold by the School of Mines, University of Missouri, for $1.

The bulletin discusses the history of underground loading and the development of equipment. The author is of the opinion that underground loading has come to stay and that there are enough reliable mechanical loading appliances to adapt it to any condition that may be met.

Standard Slag Company Builds its Seventeenth Crushing Plant

A Plant Which Represents the Mature Experience Gained by Years of Preparing Slag for the Market

THERE is no doubt but that the use of slag as concrete aggregate and road building material in the United States is increasing, and it is increasing because the makers of crushed slag have been bettering the product and showing their prospective customers the advantages of its use. Among the companies who have carried on this work the Standard Slag Co., of Youngstown, Ohio, occupies as high a place as any. It not only operates 17 plants in various parts of the country but it is constantly carrying on research work to show the public how to use crushed slag in the most economical way.

Crushed slag production really begins in the furnace. It is fortunate that a good slag means a good pig iron, so the production of good slag is to the furnace man's advantage. He did not consider the slag much in an earlier time and it was hard to convince him that it had any value. In fact, it made him "sore" to be told that the furnace should be run with an eye to slag as well as iron production, and that the slag must be disposed of in a rather particular manner in order to make a good product. But the slag man was persistent and the fact that a good slag meant a good iron was the most powerful of arguments, and now, both in this country and abroad, the furnace men are ready to meet the slag men half way, and the public has been benefited by the addition of another good mineral aggregate, especially in localities where coarse aggregates are really scarce.

One such locality is northeastern Ohio, where, to quote Mr. Beeghly, the president of the Standard company, "geology has put slag on the market." He pointed out to Rock Products editor that east of a line drawn south from Sandusky there is no crushed stone production except that around Hillsville, near the Pennsylvania line, and not nearly enough gravel production to supply the demand for coarse aggregate. In this section are great industrial centers, most of which are large producers of iron and steel. Quite naturally there is a large production of crushed slag there. The Standard Company alone has 15 plants operating in and around Youngstown, Ironton, Dover, Steubenville, Leetonia and other points near the eastern line of Ohio, from which it ships its products to many towns and cities, in some of which it operates its own yards and distribution systems.

Looking toward the plant from the cooling pits. The fragments in the center are "skulls" of slag which has cooled in the ladle

The latest of these plants, which is to be described here, is just on the edge of Youngstown, and it is the 17th plant that the company has built. With so much

Copyright photograph by Hamilton Maxwell, Inc., New York

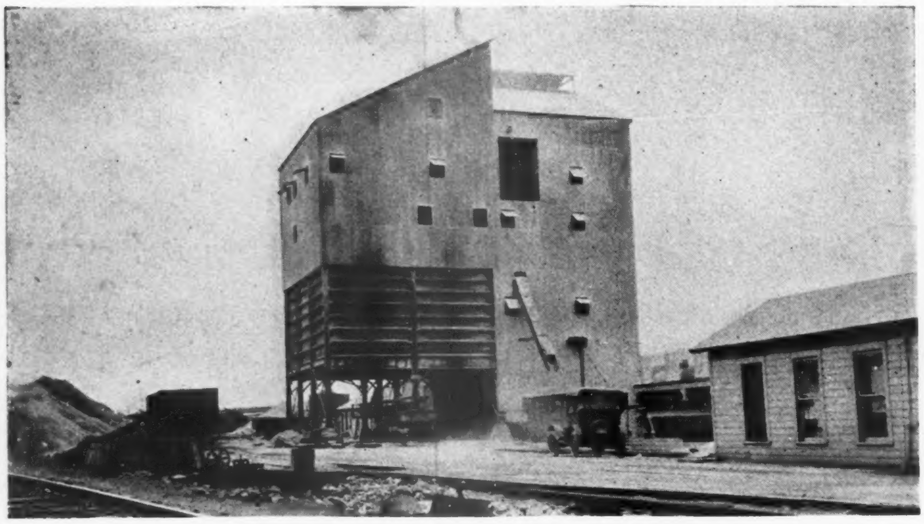
King Plaster Sand Plant of the Goodwin-Gallagher Sa

This is the third of a series of hydroplane views of the Goodwin-Gallagher company's operations. The plant was formerly owned by When J. B. King & Co. was purchased by the United States Gypsum Co., the Goodwin-Gallagher Sand and Gravel Co. leas

llagher Sand and Gravel Co. on the North Shore of Long Island

owned by J. B. King & Co., gypsum plaster manufacturers and operated by this company for the production of dried sand for mixed plasters. el Co. leased this plant and now produce dried sand for the United States Gypsum Co.'s mixed plaster sold in the New York market

experience behind the design, it is natural that this plant should represent its matured opinion of what a crushing plant should be.



Railroad side of plant. The building at the right is the office and research laboratory

Formerly slag crushing companies worked old slag dumps which might contain (and generally did) almost anything in the way of trash and refuse from the steel plant. Today all the slag that is to be crushed is poured into long pits. Those at this plant are 700 ft long and 30 ft. wide. There are three of them, so that while one is cooling another is being worked and the third is being filled. Tracks by the sides of these pits serve for the ladles to be brought alongside for dumping the slag into the pit and also for the cars to run on to take the cooled slag away to the crushing plant.

The slag is recovered from these pits by a Marion 70 steam shovel(railroad type) mounted on crawler treads. It is loaded into 30-ton Western side dump cars of all steel construction and taken to the plant hopper which is below the rail level.

This hopper is provided with a number of Jeffrey reciprocating feeders which discharge on to a 40-in. pan conveyor. By the use of these feeders in turn or in combination the feed may be regulated and the last of the 60 tons which the hopper contains may be drawn out.

The pan conveyor takes the slag to a 40-in. bucket and belt elevator of the close-connected type by which it is lifted to the 5x12 ft. scalping screen. The oversize of this screen goes to a No. 7½ gyratory crusher and after passing through the crusher to a 30-in. bucket and belt elevator, also of the close connected type, by which it returns to the same screen. Thus only the product which passes the 4-in. holes of the scalping screen goes to the fine crushing and finished product bins.

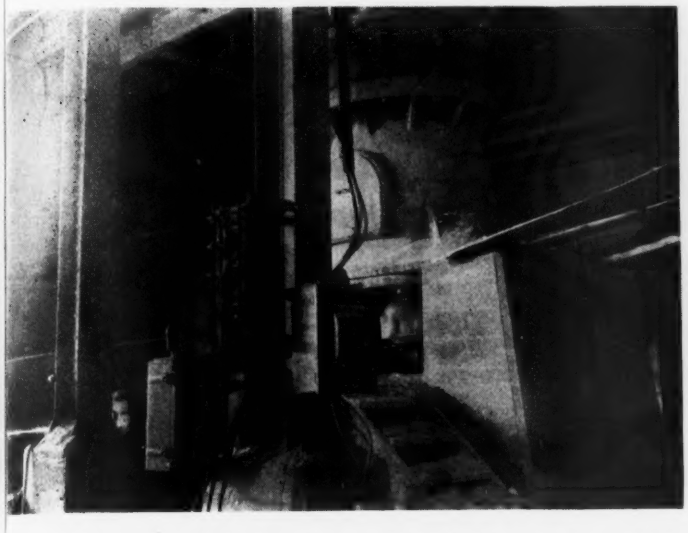
On its way to the scalping screen the discharge of the crusher passes over a Dings magnetic pulley and 48-in. belt which recovers a great deal of the iron that is produced as a byproduct of the plant.

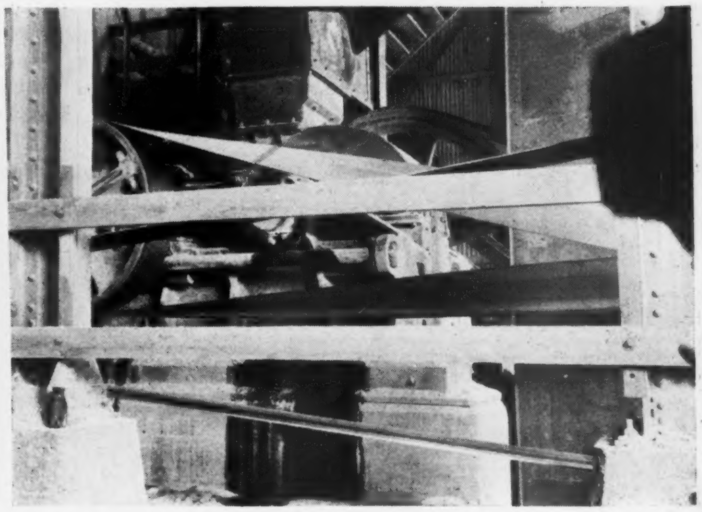
The undersize of the screen goes to another 40-in. elevator of the same type as that already mentioned which dis-

Hopper side of plant. The hopper is in front of cars in the left center

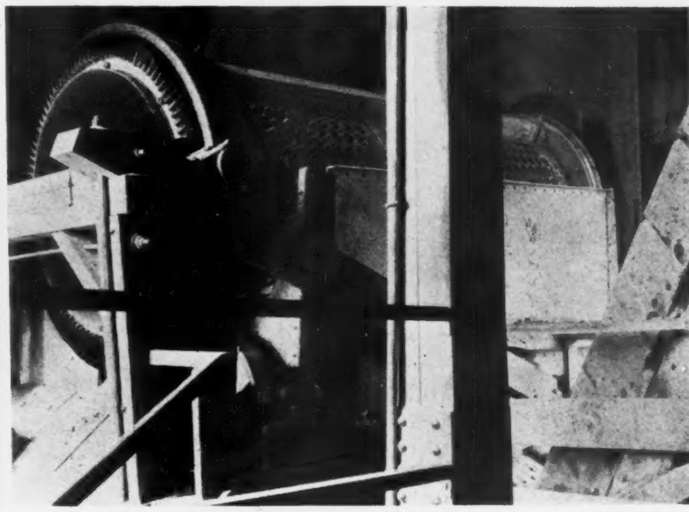
Left—Reciprocating feeders and pan conveyor under hopper. Right—Elevator (40-in.) that takes the slag from the pan conveyor to the scalping screen

Details of the Standard Slag Company's Newest Plant

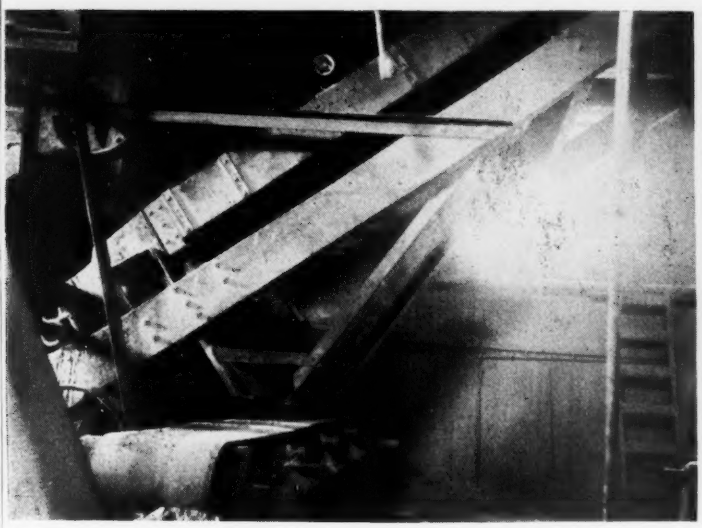


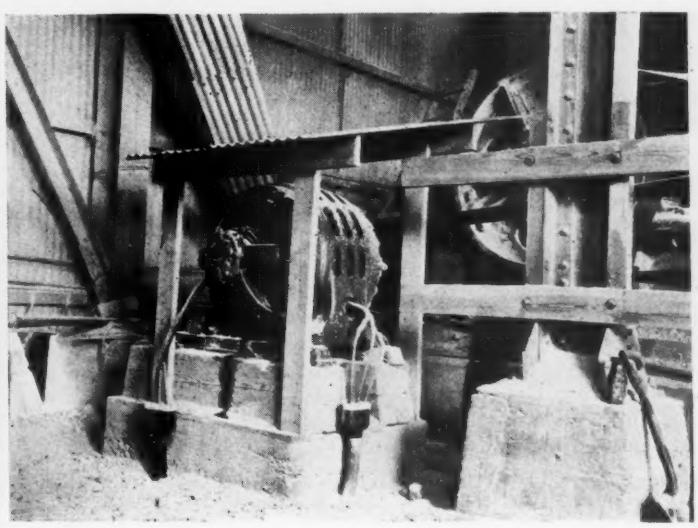


Left—The primary crusher. Right—The rolls by which the coarser sizes are recrushed to finer sizes. The roll is a machine well adapted to this work as it can be easily set to produce a product of a required size



Left—One of the two magnetic separators by which the iron freed from the slag in crushing is taken out. This iron is returned to the blast furnaces. Right—The scalping screen. The fine screens in the plant are of the same type





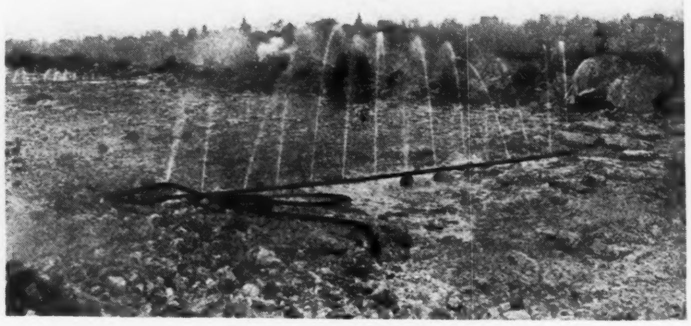
Left—Shaking screens are used to separate the finer sizes, the finest size being known as "slag sand." Right—Motor and drive of rolls and accessory machines

charges it on the belt of a second magnetic separator, 60 in. wide. Here the remainder of the free iron is taken out. This iron is spouted to a car outside the building and returned to the furnaces. The slag goes to two 5x12-ft. revolving screens which make the following products: No. 1 (3-in. to 4-in.), No. 2 (1½-in. to 3-in.), and a product from 1½-in. down 50-ton American and a 30-ton Vulcan.

The crushing and screening machinery was supplied by the Allis-Chalmers Manufacturing Co. and most of the elevating and conveying equipment by the Jeffrey Manufacturing Co. The motor equipment of the plant includes four 75 h.p., one 15 h.p. and one 10 h.p. Allis-Chalmers motors and one 100 h.p. Fairbanks-Morse motor which drives the rolls.

A testing laboratory has quite recently been installed at this plant. It is in charge of Fred Hubbard, nationally known as a consulting engineer. Experiments were being carried on when the plant was visited especially to determine the workability of concrete made with the No. 7 product of the plant in place of sand. It

Left—A slag train pouring slag into cooling pits. Right—Looking down a dug out pit



Left—Steam shovel digging slag. Right—Cooling the surface of slag in the pits so that men can walk on it

which goes to three 5x12-ft. revolving screens.

These screens make as products: No. 3 (1½-in. to ⅞-in.), No. 4 (⅞-in. to ⅜-in.), and a product from ⅜-in. down which is sent to a universal vibrating screen. This screen makes two products: No. 6 (⅜-in. to ¼-in.) and No. 7 which contains everything from ¼-in. down. No. 7 is also known as slag sand.

The coarser sizes may be crushed to the finer sizes by means of a pair of 42-in. rolls. The discharge of these rolls is elevated to the screens which separate it into the finer of the above mentioned sizes.

Finished products fall into bins from which they are loaded into cars. A considerable part of the product is sent to stockpiles in the season when construction is slack. For loading in and out of stockpiles a 20-ton Ohio locomotive crane with 50-ft. boom is employed. Two locomotives are used in handling cars, both at the plant yard and at the cooling pits, a

O. C. Winters, District Superintendent

was found that the workability varied with the grading and that a very satisfactory concrete, from the standpoint of workability as well as strength, could be made if the grading of this "slag sand" was held within certain limits. Investigation was also being made in the use of the finer sizes of slag for concrete products. Slag has a great many advantages as a products aggregate and is already much employed in that way. These experiments were intended to show that the amount of cement needed for a given strength might be less when slag was used than with other aggregates.

O. C. Winters, district superintendent, has charge of all the plants in and around Youngstown. O. E. Welch is superintendent of the plant which has been described. The main office of the Standard Slag Co. is at Youngstown. L. A. Beeghly is president of the company, W. E. Bliss is vice-president in charge of operations and W. H. Kilcawlay is secretary.

An Important Book on the Non-metallic Minerals

Reviewed by Oliver Bowles

Head of Bureau of Mines Experiment Station, New Brunswick, N. J.

"NONMETALLIC Minerals, Occurrence, Preparation, Utilization," by Raymond B. Ladoo, (McGraw-Hill Book Co., 1925, 686 pps., price, $6.00) represents the first attempt ever made to compile a general text on the technology of the nonmetallic minerals. Other books, mineralogical or geological in character are available, but in none of them is more than brief reference made to processes of mining, preparation for market, character of products or problems of utilization. The author spent several years in the nonmetallic section of the United States Bureau of Mines, and in this capacity compiled a great volume of data in response to a wide demand for information on mineral subjects. The continued demand from many sources for data thus accumulated led him to undertake a systematic selection and arrangement of the material in book form.

The important problem was judicious choice of the most pertinent facts, and drastic pruning of a great mass of data to keep the resulting publication within the limits of a single volume. Readers of ROCK PRODUCTS will probably find occasion for criticism in the brief treatment accorded to lime, cement, sand and gravel and the stone industries. As pointed out in the introduction, these subjects are fairly well covered in numerous books and periodicals, and for this reason when the necessity arose for further contraction many pages of carefully prepared data on these topics were discarded.

On the other hand, many subjects of much less importance had so meager a bibliography that an effort was made to cover them more or less completely. Aside from the structural materials group which constitutes the main center of interest for ROCK PRODUCTS readers, there are no doubt a great many subjects treated that will command attention. Most stone product manufacturers are interested in abrasives, refractories, mineral fillers, silica, slate and various other commodities.

Mr. Ladoo's new book covers 86 mineral subjects given in alphabetical order. They are discussed under such headings as occurrence, properties, distribution, production and consumption, mining and preparation, specifications and tests, utilization, markets and prices. The outstanding feature of the book is its comprehensive treatment of technologic problems such as processes of manufacture, utilization and markets, subjects which appeal particularly to the practical man. The reviewer was intimately associated with the author during much of the period spent in preparation of the manuscript, and he can testify to the untiring energy devoted to the accumulation of data from hundreds of different sources. When it is realized that an entire book could be written on any one of a majority of the 86 subjects treated, some idea may be gained of the necessity that confronted the author of weighing carefully and selecting wisely. Some of the topics include entire groups of minerals. Subjects to which the most space is given, each occupying 18 pages or more of the text, are clay, graphite, gypsum, magnesite, mineral pigments, phosphate rock, potash, salt, slate, and sodium compounds. The treatment of any particular subject in a general work of this character must of necessity be brief, and in order to afford the reader who may have a special interest in a subject an opportunity to conduct a more thorough study, a bibliography of important books and articles is given at the end of each discussion. Owing to the necessity for brevity the bibliographies are also much shorter than was desired, some of them being reduced to a fraction of what was originally prepared. While for the most part they are carefully selected, some important references have been omitted. The inclusion of lists of periodicals that devote considerable space to the subjects under consideration is a unique feature.

The chapter on mineral pigments may be taken as a typical example of the data presented. A general grouping of mineral pigments is given followed by a classification on the basis of color with a description of each variety; mineral reds (20 varieties), orange (5 varieties), yellows (6), greens (5), blues (5), browns (9), blacks (6), whites 6), miscellaneous colors, mortar colors. Following this is a page on the properties of natural earth pigments, 6½ pages on distribution, production, and consumption, with tables, 2 pages on mining and treatment with a flow sheet of an ocher mill, 2 pages on grades and tests, 2 pages on marketing and prices, a page on utilization and a page of references. This supplies practically all the information desired by anyone except a paint specialist.

An appendix to the book includes the scale of hardness, scale of fusibility, melting points of seger cones, international atomic weights, and a general bibliography comprising books and reports, periodicals, government and state publications.

The book is a milestone of progress in that it assembles for the first time the modern technology of the nonmetallic minerals. In many instances the reader will be impressed with the crudity of process, and the tremendous need of more intensive research in the properties of minerals, their preparation and utilization. In many branches their technology lags far behind the attainments of modern metal mining and metallurgy. Possibly this logical assembly of known facts will assist in crystallizing present knowledge, and in constituting an incentive for more energetic research. The wealth of information renders the book indispensable to those directly interested in any way in nonmetallic problems.

Fertilizer Consolidation

AT a meeting at the Chamber of Commerce in Philadelphia, May 6, some 40 fertilizer firms planned for the organization of a great national fertilizer body to be made up of the present National Fertilizer Association and the Southern Association, New York, New Jersey and Pennsylvania will be Group 2 of the new jurisdiction, and it was firms from these states which participated in the meeting.

Permanent headquarters will be maintained at Washington, and it is hoped that closer affiliation and co-operation will result, together with more centralized and unified research and a better feeling in the industry as well as better business.

Final action will be taken at the annual meetings of the two bodies at White Sulphur Springs, Va., on June 8.

The meeting was presided over by James S. Coale, vice-president of the I. P. Thomas and Son Co., Philadelphia. Among the speakers were Albert French, vice-president of the International Agricultural Corporation, New York; Myron Haden, general sales manager of the American Agricultural Chemical Co., New York; E. C. Hutchinson, president of the Trenton Bone Fertilizer Co., Trenton, N. J., and Warner Huntingdon vice-president of the Davidson Chemical Co., Baltimore.—*Chemical Record-Age.*

Oklahoma Cement Plant Made Perfect Safety Record

A RECORD of 44 days without a single lost-time accident has been made at the plants of the Oklahoma Portland Cement Co. at Ada, Okla.

With a total of 382 workmen reporting every day and the many hazardous occupations numbered among the list of jobs, this is considered quite an achievement.

Following is the record of the three plants from which the average was computed: Mill No. 1, at Ada, 80 days; Mill No. 2, at Ada, 44 days, and the quarry at Lawrence, 70 days.

For the first time in two years, during a calendar month, records show, the three plants came through without a single mishap, April 30 completing the 44th day.

Jollifications and get-togethers are held from time to time at the cement plant. During April there was a total of three picture shows given for the workmen and several banquets.—*Ada (Okla.) News.*

Financial News and Comment

Canada Crushed Stone Corporation Bonds Offered

RICE, GIBSON & Co., Toronto, are offering at 99 and int., to yield 6.55%, $300,000 first mortgage, 20-year, 6½% sinking fund bonds, of the Canada Crushed Stone Corporation, Ltd., Dundas, Ont. A circular shows:

Dated December 1, 1924. Principal and interest, (J. & D.) payable at the holder's option in Canadian funds at the Royal Bank of Canada, Toronto, Montreal and Hamilton. Denomination $1,000 and $500. Redeemable all or part on any interest date on 30 days' notice at 103 and interest. National Trust Co., Ltd., trustee.

Capitalization	Authorized	Issued
6½ first mortgage bonds (this issue)	$600,000	$300,000
7% redeemable debenture stock	50,000	50,000
6% cumulative redeemable preference shares	750,000	694,300
Common shares	750,000	750,000

Sinking Fund.—The trust deed will provide for an annual cumulative sinking fund commencing Dec. 1, 1925, equal to 2½% of all issued first mortgage 6½s, together with an amount equivalent to the annual interest on all bonds redeemed. It is estimated that this sinking fund will redeem the entire issue of these bonds at or before maturity.

Company.—Is the largest producer and merchandiser in Canada of crushed stone in all sizes. It also produces a very substantial tonnage of by-products such as agricultural lime, flux, grit and building stone, and through its selling organization distributes supplies allied to the construction business. Plant, situated at Dundas, Ont., has an annual capacity of 750,000 tons of crushed stone and 50,000 tons of by-products. Company also operates two other quarries at Hagersville and Vinemount, each having an annual capacity of 100,000 tons of crushed stone, and one distributing plant at Hamilton, all owned by its subsidiary companies.

Earnings.—Average annual net earnings, after all operating expenses, full and proper maintenance charges and all taxes, other than Federal income tax available for payment of bond interest, have been as follows:

	Avge. Yearly Earns.	Bond. Int. Earned
Eleven fiscal years, 1914-1924	$94,957	Over 4½ times
Six fiscal years, 1919-1924	134,445	Over 6½ times

U. S. Gypsum Pays Extra Dividend

THE directors of the United States Gypsum Co., Chicago, have declared an extra cash dividend of 5% on the common stock of par value $20, payable June 1 to holders of record May 27.

The usual quarterly dividends of 2% on the common and 1¾% on the preferred stock have also been declared, payable June 30 to holders of record June 15. Regular quarterly dividends of like amount were paid on the respective issues on March 31, last.

International Cement Statement for First Quarter

THE following is the consolidated profit and loss statement of the International Cement Corporation, giving the results from operations for the first quarter, 1925:

	First Quarter 1925
Gross Sales	$3,782,201.44
Less Packages, Discounts and Allowances	650,575.67
Net Sales	$3,131,625.77
Manufacturing Costs, excluding Depreciation	$1,509,353.10
Depreciation	171,354.95
	$1,680,708.05
Manufacturing Profit	$1,450,917.72
Shipping, Selling and Administrative Expenses	573,434.14
Net Profit	$ 877,483.58
Miscellaneous and Financial Income	8,013.58
	$ 885,497.16
Reserve for Federal Taxes and Contingencies	171,558.38
Net to Surplus	$ 713,938.78

As shown above, the net to surplus for the first quarter amounted to $713,938.78 as compared with $442,013.08 for the first quarter of 1924. These earnings, after allowing for accrued preferred dividends, are equivalent to $1.64 per share on 400,000 shares of common stock outstanding at the present time.

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Alpha Portland Cement Co.	May 25	100	100	110	1½% quar.
Arundel Corporation (sand and gravel—new stock)	May 22	No par	25⅜	25⅜	30c quar.
Arundel Corporation	Feb. 11	50	112	113½	
Atlas Portland Cement Co. (new)	May 25	No par	45	47	1% quar.
Atlas Portland Cement Co. (preferred)	....	33⅓	....	....	
Boston Sand & Gravel Co.	Mar. 27	100	63½	63½	
Canada Cement Co., Ltd.	May 26	100	104⅞	105	1½% quar. Apr. 16
Canada Cement Co. Ltd. (preferred)	Apr. 30	100	113½	114¼	1¾% quar. May 16
Charles Warner Co. (lime, crushed stone, sand and gravel)	May 22	No par	21½	24	50c Apr. 10
Charles Warner Co. (preferred)	May 22	100	100	102	1¾% Apr. 23
Giant Portland Cement Co.	May 23	50	30	30	
Giant Portland Cement Co. (preferred)	May 23	50	55	55	
Ideal Cement Co.	May 23	No par	62	64	75c Mar. 31
Ideal Cement Co. (preferred)	May 23	100	108	108½	1¾% quar. Mar. 31
International Cement Co. (common)	May 25	No par	64	64⅝	$1 quar. June 30
International Cement Co. (preferred)	May 23	100	104	106	1¾% quar. June 30
International Portland Cement Co. (preferred)	Mar. 1	......	30	45	
Kelley Island Lime & Transport Co.	May 25	100	103	104	2% quar.
Lehigh Portland Cement Co.	May 9	......	70	72	1½% quar. Apr. 1
Michigan Limestone and Chemical Co. (preferred)	Apr. 11	100	....	....	1¾% quar. Apr. 15
Missouri Portland Cement Co.	May 26	25	56½	....	31½c quar. June 1; 25c ex. June 1
Pacific Portland Cement Co., Consolidated	May 21	......	81	....	
Peerless Portland Cement Co.*	May 26	10	8¾	9½	
Petoskey Portland Cement Co.*	May 26	10	9	9½	1½% quar.
Pittsfield Lime and Stone Co. (preferred)	....	100	....	....	2% quar. Apr. 1
Rockland and Rockport Lime Corp. (1st preferred)	May 25	100	98	....	3½% semi-annual
Rockland and Rockport Lime Corp. (2nd preferred)	May 25	100	70	....	3% semi-annual
Rockland and Rockport Lime Corp. (common)	May 25	No par	70	....	1½% quar. May 1
Sandusky Portland Cement Co. (common)*	May 26	100	87	90	2% quar. Apr. 1, 100% payable in com. stock, Apr. 1
Santa Cruz Portland Cement Co. (bonds)	May 8	100	103½	....	6% annual
Santa Cruz Portland Cement Co. (common)	Apr. 25	50	....	60	$1 Apr. 1
Superior Portland Cement Co.	Mar. 1	100	....	120	
United States Gypsum Co. (common)	May 26	20	159½	160	2% quar. June 30
United States Gypsum Co. (preferred)	May 22	100	115	116	1¾% quar. June 30
Wabash Portland Cement Co.*	May 26	......	60	100	
Wolverine Portland Cement Co.	May 26	10	....	11¾	2% quar.

*Quotations by Watling, Lerchen & Co., Detroit, Mich.

Editorial Comment

Water Shipments of Rock Products

In the May 16 issue of Rock Products the position of rock products among commodities sent by rail was determined from A. R. A. reports, and it was shown that these exceeded in tonnage all mineral products but soft coal, and that they formed a very respectable proportion of the total tonnage.

But not all shipments of rock products are made by rail. Possibly one half of the total production of the aggregates is sent to the market by water. Almost the whole tonnage of sand, gravel and crushed stone that is used in New York comes in by water. And in the other large cities, almost all of which are ocean, lake or river ports, the proportion of the tonnage is very large.

It is difficult to get exact figures on this water-borne commerce in rock products, but occasionally tables are made out which show it in part for a single port. Such tables appear in a recent issue of the *Journal of the Western Society of Engineers*, in which the water borne commerce of Chicago is analyzed. Chicago is primarily a railroad town and the water-borne tonnage of the Chicago district is only a small part of the total received and shipped. Yet the figures are interesting as showing the heavy proportion of water-borne freight which is rock products.

The total water-borne tonnage in 1923 was 24,115,000. Of this, 55% was iron ore (13,324,000 tons). The next largest item in point of tons was limestone for fluxing, 2,904,000 tons, and the next crushed stone and sand and gravel, 1,284,000 tons. If we subtract iron ore we find that something over a third of the remaining tonnage is in rock products alone.

The author points out that water-borne traffic in such materials is increasing and notes that while only two or three vessels of the self-unloading type brought in sand and gravel before the war, there are now, in 1925, seven such with a combined yearly tonnage of 2,000,000 tons which are registered at this port.

Road Wisdom

The press service of the Department of Agriculture has issued through the newspapers a statement regarding improved roads that contains much elementary road wisdom. It states first that the users of roads pay for improvements whether they have them or not. If they do not have them, the pay comes in the form of lessened life of the vehicle, extra wear on tires and extra gas and oil consumption. It is cheaper to pay directly for the road improvement and save on these things. It next states that improvement of roads should be according to the density of the traffic, which now seems to be a well established principle with highway engineers. And in the third place, it states that there is no such thing as a permanent road and that maintenance should begin from the day the road is built. Everyone concerned in the building of highways knows these things, but the public does not. Hence the difficulties that constantly arise between the legislative bodies that appropriate road building funds and the men who are honestly trying to spend the money so raised to the best advantage. The public still needs education and a lot of it as to the building and improving of highways and it will take it with better grace from the Department of Agriculture than it will from some other source.

British Road Expenditures

We think that we are spending a lot of money for roads in the United States, but other countries are doing the same. The (British) *Contract Journal* for April 22 contains an analysis of commercial road transport in the British Isles in which it says that 54,000,000 sterling (roughly $270,000,000) are spent on the highways, "to maintain and improve the details making for increased width, straightness and easy grading." Road transport is of the greatest importance over there. The same authority says that the tonnage moved by motor vehicles last year was 357,000,000 as against 342,995,000 tons moved by rail. In this work 204,000 "good vehicles" (trucks), 4000 road locomotives and tractors and 20,000 other motor vehicles were employed. This traffic goes on and this money is spent for roads in an area which is about the same as that of the state of Illinois.

Setting and Hardening

The president of the Atlas Lumnite Cement Co. writes to a current technical magazine objecting to the use of "quick setting cement" to describe his company's product. The distinction between setting, which is a matter of hours, and hardening, which goes on for a long period of time after the setting is complete, is of course well enough understood by technical men in the cement industry, but there is a real danger that the two terms may be confused in the public mind, as even well-informed engineers sometimes use "setting" and "hardening" as if the two were interchangeable. It is hard for the lay mind to consider hardening anything but an extension of setting. Education of the public as to the distinction would seem to be necessary in order to have the advantages of quick hardening cement appreciated.

New Cement Plant to Be Built in Tuolumne County, California

AS a result of three years of investigation of raw material deposits, according to the *Sacramento (Calif.) Bee*, a $2,000,000 cement plant will be built by the new Calaveras Cement Co. at the junction of the San Antone and Calaveras rivers in Tuolumne county, near San Andreas, Calif.

The plant will be wet process and will be built in two units 2000 ft. long. The mill will constitute one unit and three storage silos of 12,000 bbl. capacity each, packing and freight sheds the other. Rotary kilns 11.3x240 ft. will be installed. The plant will be designed for a capacity of 4000 bbl. daily.

The rock will be quarried from four mountains. One mountain has been extensively investigated and a 800-ft. tunnel made through it. This investigation revealed a solid limestone 95% pure and two small deposits of shale.

William Wallace Means, assistant secretary of agriculture during the world war, who has also conducted successful engineering operations in South Africa and was at one time connected with the DeBeers diamond interests, is president of the company. Others interested in the company are: Stewart Rawlings and George P. Poor, engineers; E. L. Wilhoit, president of the Stockton (Calif.) Savings and Loan Bank; Thomas F. Baxter, former president of the Holt Manufacturing Co.; Frank A. Guernsey, former president of the Stockton United Trust and Savings Bank; George W. Liestener and F. J. Dietrich, Stockton realtors. H. A. Henry of Zanesville, Ohio, will be plant manager and William MacNider, who located these deposits, sales manager for the company.

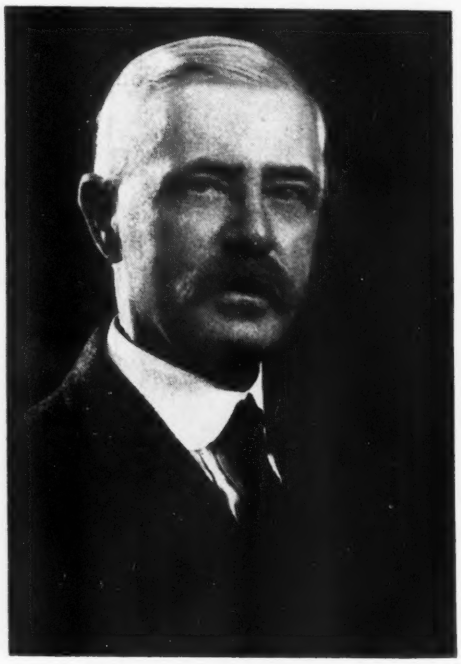
According to the same source of information, the Southern Pacific Ry. Co. will extend the Valley Springs branch road up to the plant site, giving the company the necessary transportation facilities.

Natural Cement Industry Growing

NATURAL cement, under its various trade names, is staging a comeback, states Allen E. Beals in the Dow Service daily building reports, New York. One eastern manufacturer reports contemplated additional facilities for taking care of the increasing demand. It was used in the erection of some of the largest New York hotels last year. Plants in Kansas, Kentucky, Minnesota, New York, Ohio and Pennsylvania produced 673,092 bbl. valued at $809,767 in 1923 and in 1924 they produced 673,092 bbl. valued at $859,471. For the country the year 1924 showed 1,418,461 bbl. produced against 1,271,674 in 1923, valued at $2,006,559, as compared with $1,947,352 in 1923.

John Meehan Takes a Trip to Europe

JOHN MEEHAN, erection superintendent of F. L. Smidth & Co., cement plant engineers and builders, New York and Copenhagen, Denmark, sailed recently from New York for several months' leave in Europe. He is one of the best known practical cement men in the United States—most every one in the portland cement industry knows and admires John Meehan, who has been in every corner of this country since 1899 on erection jobs for his employers.



John Meehan

While the trip is primarily a well-earned vacation (Mr. Meehan is an Irishman by birth), he will nevertheless utilize the opportunity to visit some of the principal cement plants abroad and check up on European practice.

Atlas Cement Capitalization Change Approved

AT the annual meeting of the Atlas Portland Cement Co., stockholders approved the changing of the common stock from shares of $100 each to shares of no par value and exchanging three new for each share now outstanding; reducing the authorized preferred stock from $3,000,000 to $2,500,000 by cancelling $500,000 unissued stock; changing par value of preferred stock from $100 to $33⅓, exchanging three shares of new preferred stock for each preferred now outstanding, and authorizing 100,000 new shares of no par common. The total authorized capital stock now consists of 75,000 shares of preferred of $33⅓ par value and 1,000,000 shares of common of no par value.

Directors of the company were re-elected at the meeting.

Prize Winners Chosen in Cement Plant Laboratory Design Contest

THE contest for ideas in laboratory design conducted by the Great Western Portland Cement Co., Mildred, Kan., as noted in the May 2 issue of ROCK PRODUCTS, was adjudged on May 15. The judges had such difficulty in deciding between the various plans submitted that they declared the contest a tie between E. H. Schwartz, chief chemist, Cayuga Operating Co., Inc., Portland Point, N. Y., and E. P. Newhard, chief chemist, Clinchfield Portland Cement Co., Kingsport, Tenn.

The design submitted by Mr. Newhard was in the form of a complete report on laboratory layout and equipment, profusely illustrated by photographs. Particular attention was paid to lighting and arrangement of accessory equipment to expedite testing.

Mr. Schwartz submitted designs equally complete including floor plans and sketches with very complete detailed description of the proposed equipment.

The company expects to begin construction of this new laboratory as soon as the best ideas submitted can be worked into a design suitable for the requirements of its plant. The building will be of cinder block and concrete construction and concrete will be used as far as possible in making the tables, closets, etc. An unusual feature will be the space and equipment provided for the customer's testers, particularly the resident testers of the Missouri State Highway Commission.

Government Specification for Calcined Gypsum

THE Bureau of Standards, Circular No. 206, giving government specifications for calcined gypsum, has been issued. The classes of this material, requirements and methods of sampling and testing are given. As to general requirements, calcined gypsum must show a chemical content of not less than 60.5% by weight of $CaSO_4 . \frac{1}{2}H_2O$; a tensile strength of not less than 200 lb. per sq. in. and a compressive strength of not less than 1000 lb. per sq. in.

Copies of this circular are obtainable at five cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Standard Slag Company Expands

THE Johnstown Slag Co. of Johnstown, Penn., formerly controlled by F. K. Sheesley, president, and H. R. Replogle, vice-president and general manager, has sold its entire interests to the Standard Slag Co. of Youngstown, Ohio.

The plant is located on the Conemaugh and Blacklick R. R., one mile east of Franklin Borough, and the new offices are located in the Farmers' Trust building, Main street.

Rock Products Production in Province of Quebec in 1924

By Gordon C. Keith, M. S.
Toronto, Ont.

THE preliminary statement of the mineral production in the Province of Quebec, Canada, for 1924 has recently been issued. In 1923 the production of portland cement was 3,173,993 bbl., valued at $6,347,986, while in 1924 it was 2,754,979 bbl., valued at $4,793,664.* As the cement mills now in operation in the province have a capacity to turn out 6,000,000 bbl. a year, they were working at about 50% of their possibility. Two new companies have been building mills in the province, at St. Francois de Sales and Montreal East, which will give an additional capacity of output of over 1,000,000 bbl. annually.

The greater amount of limestone quarried in Quebec was used for road construction. In 1924 the production was 1,438,459 tons, valued at $1,951,260. The 1923 production was valued at $1,976,665.

Lime to the extent of 77,945 tons, valued at $626,295, was produced in 1924 compared with $574,741 in 1923.

Sand quarried in 1924 was valued at $367,803, compared with $453,382 in 1923.

*Subject to revision.

To Develop Oklahoma Rock Asphalt Deposits

ROCK asphalt from Oklahoma mines, for use in surfacing Oklahoma roads, is to have a place in the road-building program that is just now having its real beginning in the state, according to the Oklahoma, Okla., *Oklahoman*.

Millions of tons of this material, which heretofore has been obtainable only in rather limited quantities on account of the large expenditure necessary in proper development, will be available through the financing of the mines, or quarries, near Dougherty, Murray county, and the assurance of quantity production. The central Material and Supply Co. of Oklahoma City, which has taken over the properties formerly belonging to the Continental Oil and Asphalt Co., has added largely to the equipment and completed an organization for mining and shipping this product.

Altogether, more than $1,000,000 has been invested in development of these asphalt mines. The Continental spent about $750,000 in securing land, leases and equipment, and in development work, before financial reverses in other lines made it necessary to part with these holdings. This development included the building of seven miles of private railway line to conduct with the Santa Fe at Daugherty, purchase of cars and engines, building of crushers with special equipment, and housing facilities for employes.

Since acquiring the property, the Central has added to this materially, and announces its readiness to furnish the native road material in commercial quantities of the volume necessary in road building.

Charles Warner Company Expands

THE Charles Warner Co. of Wilmington, Del., which has been operating the American Lime and Stone Co. under a management contract for the last three years, has now purchased the controlling interest of the American company from the estate of A. G. Morris of Bellefonte, Penn., and from J. K. McLanahan, Jr., of Hollidaysburg, Penn. The American Lime and Stone Co. operates extensive building and chemical lime plants at Bellefonte, Penn., and several crushing plants for preparing furnace, ballast and construction stone, located in the Bellefonte, Tyrone and Hollidaysburg districts.—*Philadelphia (Penn.) Public Ledger.*

Oklahoma Asphalt Deposits Ordered Sold

SECRETARY of Interior Hubert Work recently authorized the sale of the remaining coal and asphalt deposits owned by the Choctaw and Chickasha Indians in Oklahoma comprising 300,130 acres of unleased and 69,212 of leased land with an appraised value of approximately $9,529,524, located in Leflore, Latimer, Pittsburg, Coal and Haskell counties. The property will be sold to the highest bidder at public auction on June 29 and 30 at McAlester, Okla., by the superintendent of the five civilized tribes. No bid will be considered for less than the appraised value.—*Independence (Kan.) Reporter.*

Petoskey Cement Company Reorganized

AT a meeting of the board of directors of the Petoskey Portland Cement Co., recently, J. B. John resigned as general manager and John L. A. Galster was named to fill the vacancy. Mr. John stated he felt he could not give the proper amount of time to the supervision of the work of the local plant and that he believed the manager should be on the ground. He will continue as president of the company and also of the Petoskey Transportation Co.

Mr. Galster resigned as secretary of the company and Emery O. Nyman was named to this vacancy. Homer Sly continues as first vice-president and Joseph A. Magnus as second vice-president. Mr. Galster's new title will be treasurer and general manager.

Directors inspected the new plant, which will be opened June 15. The company's April shipments were the largest on record.—*Grand Rapids (Mich.) Herald.*

Process of Briquetting Phosphate Rock

JAMES A. BARR, Mt. Pleasant, Tenn., who is well known to the readers of ROCK PRODUCTS for his articles on the phosphate industry, has recently been granted a patent on a method of briquetting fine phosphate rock in heat reducing processes. Such briquettes are particularly adapted for use in blast furnaces in making iron, the phosphorous being added to the iron to increase its fluidity.

In the place of the ordinary binders, such as pitch, which have proven uneconomical, Mr. Barr uses phosphoric acid. This not only makes a good binder but increases the phosphorous content of the briquette, giving it added value for the purpose. Crude phosphoric acid is preferred, the impurities adding to its value as a binder. The patent is No. 1,534,828, dated April 21.

New Data on Illinois' Molding Sand Resources

A PRELIMINARY report of an investigation of the molding sand resources of Illinois has just been issued from the press by the State Geological Survey. This report is the result of a careful field and laboratory study of the molding sand deposits of the state and of representative samples taken from the deposits. Standardized labortory tests recommended by the joint committee of the American Foundrymen's Association and the National Research Council were made on the samples in co-operation with the Engineering Experiment Station of the University of Illinois. Similar testing is being carried on by other states who are also using standardized tests, making the results of one state comparable with those of another.

Illinois ranks third in the production of molding sand and fifth in the number of foundries. The production in 1923 was 798,683 tons, of which 647,963 tons were steel sand and 150,720 tons natural bonded sand. It is believed that this investigation will result in acquainting the foundries with suitable sands located within the state which information will react beneficially both to the foundries and the molding sand producers. The commercial molding sand resources of the state having a natural bond are estimated to approximate at least 6,000,000 tons exclusive of the St. Peter formation (silica sands) and the limy yellow silts (loess) in the western part of the state. Eighty-five of the 102 counties of the state have produced molding sand or contain it in what might be commercial deposits.

The report may be secured by writing the Chief, State Geological Survey, Urbana, and asking for Report of Investigations No. 3. The price of the pamphlet is 20 cents, which may be remitted in stamps or cash.

Paul Bellamy Resigns as Manager of South Dakota Cement Plant

PAUL BELLAMY has resigned as manager of the South Dakota state cement plant and secretary-treasurer of the cement commission and is visiting points in Iowa on a vacation trip before returning to his home at Rapid City.

The resignation is said to have been presented to Governor Carl Gunderson, but apparently has not been accepted. The governor said recently that Mr. Bellamy was still plant manager, although E. C. Thorpe, of Lead, S. D., member of the cement commission, is acting as manager.

Increasing friction between Mr. Bellamy and the rest of the cement commission, including the governor, over policies of the plant, is blamed for his retirement from the position to which he was appointed by the governor on January 6.

Mr. Bellamy had been accounted one of the governor's most intimate advisers. His resignation from the cement commission marks his second retirement from that post. He withdrew as a member of the commission during the administration of Governor W. H. McMaster after an altercation with that executive.

Commenting upon the cement plant's affairs, Mr. Bellamy declared that during his term as manager the plant had made more than enough money to pay running expenses and the cost of extensive repairs, and that with the selling season just getting well under way, the plant had disposed of approximately a third of its possible annual output.—*Aberdeen (S. D.) News.*

British Columbia Cement Plant Will Grind Belgian Clinker

A CEMENT FACTORY, said to be the first of its kind in America, is in course of establishment on Granville Island, False Creek and will be a totally new addition to Vancouver, B. C., Canada, industries when it begins operations about June 15.

W. J. Budd is organizer and has been named managing director of the Coast Cement Co. Capital has been secured largely from local sources. It is estimated that the completed plant will involve an expenditure of $750,000.

Buildings and realty formerly owned by Watson Bros. Fishing and Packing Co., Ltd., at the west end of Granville Island, have been secured by the new company. The buildings are large and substantially constructed and the site has excellent shipping facilities by both water and rail.

Plans of the company are unique in that, for a time at least, it will import cement clinker from Belgium. A very low freight rate has been secured, as the clinker will be brought as ballast in ships coming here for the grain and other trade. Gypsum will be secured locally by the opening up of beds near Vancouver.

Low Magnesia Content

The cement will be of high quality, it is claimed, and will contain only 1% of magnesia.

Mechanics are now engaged installing the necessary machinery for grinding the cement clinker, orders for which have been placed in Belgium for some time.

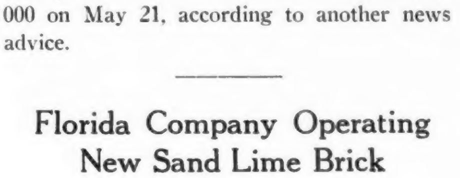
While the factory will operate on the imported clinker for some time, probably a year, it has secured and will develop large leaseholds of limestone and shale in the vicinity of Agassiz, B. C. This will eliminate the importation of clinker and the industry will then be purely domestic.

The company already has made contracts for a considerable part of its output and it is confidently believed that demonstration of such a factory, working on the imported clinker, will result in the larger capital, required for the development of manufacture from local raw material, being quickly secured.—*Vancouver (B. C.) Morning Sun.*

This plant of the Coast Cement Co., was damaged by fire to the extent of about $20,000 on May 21, according to another news advice.

Florida Company Operating New Sand Lime Brick Plant

THE Plant City Brick Co., which formerly operated a sand-lime brick plant at Plant City, Fla., as described in the August 9, 1924, issue of ROCK PRODUCTS, is now operating its new plant at Wilkinson, Fla., and producing 45,000 bricks daily.



C. W. Wilkinson

Railroad connection was made by constructing a 1200-ft. spur to the plant. The site was named "Wilkinson" in honor of C. W. Wilkinson, shown in accompanying photo, superintendent and plant manager. The place is 4½ miles from Plant City and about 18 miles from Tampa.

New Process of Making High Alumina Cement

EDWIN C. ECKEL, well-known for his writings on cement, lime and gypsum, has patented a process for making high alumina cement which he has developed with the idea of overcoming many of the difficulties of the present manufacturing process.

Briefly, the process consists of using a furnace like the blast furnace used for smelting iron ore, in using crude limestone in the place of lime, low grade bauxite in the place of the high grade material which is ordinarily used, and especially adding iron ore to the charge. This addition is made to prevent freezing in the furnace (a difficulty with former processes) and to aid in fluxing. It also adds to the salable tonnage per ton of fuel which reduces the cost of producing cement. A typical mix is described as equal parts of limestone and bauxite and 25 to 50% iron ore which may be either a carbonate or an oxide provided it carries less than 10% of silica.

In effect, Mr. Eckel's process is that of smelting iron ore with the addition of a large amount of such a slag forming material that the slag formed will be a fused, high alumina cement.

The process seems a reasonable and logical development, and to have been worked out from a thorough study of the manufacture of high alumina cement. It is interesting to note that there are parts of the United States where a plant would find all the materials needed close at hand. One such is near the Tennessee-Alabama line, where bauxite, limestone, iron ore and coking coal are all to be found within what might be considered a reasonable distance of a good shipping point.

Debate South Dakota Cement Plant Disposal

"RESOLVED, That the state of South Dakota should dispose of the cement plant at Rapid City," was the question for debate at the regular meeting of the Athenian Debating Club in the Sioux Falls, S. D., Y. M. C. A. recently. The affirmative, given a 2-1 decision, was composed of Kenneth Wyman and Adolph Lodmell. On the negative were Gerald Gill and R. O. Hillgren. An interesting discussion on what the cement association might do to compete with the plant followed the formal debate.—*Sioux Falls (S. D.) Argus-Leader.*

California Producers' Displays at Industrial Exposition

NOTABLE among the 152 industries and other businesses represented at the Fifth Annual Harbor Industrial Exposition at Long Beach, Calif., were the displays of local rock companies.

Simplicity was the keynote of the booth of the Union Rock Co., there being no attempt to catch the eye of the spectator with flamboyant designs or advertising methods.

The beautiful exhibits of two of the leading aggregate producers on the Pacific Coast at the industrial exhibition at Long Beach, California

On display at this booth were the various types of rock, gravel and sand quarried at the company's different plants.

The Graham Brothers, Inc., booth exhibited their Catalina rock, and as Catalina Island is the most picturesque spot in all southern California, the booth was hung with large pictures and paintings of the island. Catalina rock pennants were profusely hung around the booth. In a glass enclosed cabinet was a faithful reproduction of the steamship *Catalina*, owned by the Wrigley interests, which daily plies between Long Beach and Catalina Island. Nearby were displays of sand and gravel. During the exposition this firm had a continual showing of moving pictures of their different plants. This film was projected on a small screen in the booth and was easily visible by those passing along the aisle between the booths.

Another of "Sandy" Pratt's Advertisements

THE advertisements of "Sandy" Pratt, the California producer who has built up a big business by clever publicity, are always of interest. The latest specimen which, he says, violates all rules of advertising, really does not do so. It advertises effectively the fact that not only sand but a full line of mineral aggregates is produced and kept in stock:

The Letter

San Francisco, May 4, 1925.

Dear Sirs:

This letter is contrary to all rules of advertising. High-priced managers of advertising say you must talk about only one thing in writing a letter like this.

First, I want to tell you about our new products at Prattrock (near Folsom). We are now producing four new materials, none of which were made by us in 1924. They are:

Concrete Mix (sand, rock and gravel).
Dustless Screenings (crushed rock ¼-in. to ½-in.).
Rock Dust (dust to ¼-in.).
Concrete Topping Sand.

Besides these wonderful materials we also produce at Prattrock:

Crushed Rock ¼-in. to ¾-in.; ¼-in. to 1-in.; ¾-in. to 1½-in.; 1½-in. to 2½-in.

Washed Gravel ¼-in. to ¾-in.; ¼-in. to 1-in.; ¼-in. to 1½-in.

Cobbles.

Screenings—Dust to ⅜-in.

Some news about our three sand plants. The rains and mountain snows have raised the American and Yuba rivers so that both streams have brought down, both at Sacramento and Marysville, large quantities of clean, coarse sand. This is the first time we have had sufficient coarse sand to make a stock or reserve pile at Marysville. This will increase our supply of coarse Marysville sand.

Speaking of stock piles, we now have a stock pile of coarse, No. 4, and fine, No. 2, Prattco Amber sand at our sand plant at Prattco, (Monterey County). Our Prattco Amber No. 2 (fine) sand, of course, is suitable for brick mortar, plastering and engine sand.

When ordering sand, rock, gravel, cobbles and screenings always say "Pratt's or equal" and get the best.

SANDY PRATT,
President.

Toronto Sand-Lime Brick Company Expands

THE Leaside Brick and Sand Co., Ltd., Leaside, Ont., has purchased the plant of the Hepworth Brick Co. at Hepworth, Ont., and is now dismantling it for removal to Toronto. The plant has a capacity of 44,000 sand-lime brick per day and will be erected immediately on the Leaside company's property and put into operation with a market for the year's output assured.

A railway siding has been constructed to the company's property at Leaside.

The officers of the company are: J. E. Campbell, president; Bart Sproule, vice-president; Charles D. Berg, secretary-treasurer, 117 Wellington street, Toronto. These with Dr. A. H. Perfect and James Douglas are the directors.

Highway Research Board Adds Contact Men

CHARLES M. UPHAM, Director of the Highway Research Board, announces the extension of the board by the appointment of contact men from the various engineering colleges of the country. At the present time, 80 colleges have responded to the call by appointing a member from the faculty to act with the board. The contact man in every case has been one who has done considerable work along the lines of highway research.

Many important research problems are now being studied by the colleges, and it is felt that the activities of these institutions should be correlated with those of other research agencies. The research agencies of the state highway departments and the engineering colleges are constantly at work not only to improve the construction of better highways, but also to study the economic factors that enter into the problem.

Traffic and Transportation

By EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning May 25:

Central Freight Association Docket

10673. Stone, broken, crushed, and screenings. Rockpoint, Penn., to Ellwood City, Penn. Present, 70 cents; proposed, 60 cents per 2000 lb.

10678. Sand and gravel. Sandusky, Huron, Ceylon and Amherst, Ohio, to Elyria, Ohio. Present, 80 cents per net ton; proposed, 70 cents per net ton.

10686. Sand, lake and beach. Michigan City, Ind., to Cleveland, Ohio. Present, $2.52 per net ton; proposed, $2.14 per net ton.

10695. Sand, blast, engine, foundry, glass, loam, molding or silica. Falconer and Kennedy, N. Y., to Buffalo and Black Rock, N. Y., and Depew, N. Y. Proposed, $1 per net ton to Buffalo and Black Rock, N. Y., and $1.10 per net ton to Depew, N. Y.

10696. Sand and gravel. Lafayette, Ind., to Kentland, Ind. Present, 88 cents per net ton; proposed, 76 cents per net ton.

10697. Sand and gravel. Indianapolis, Ind., to Fortville, Ind. Present, 75 cents per net ton; proposed, 63 cents per net ton.

10698. Rock, asphalt and bituminous. Cincinnati, Ohio, when originating in Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Virginia to Napoleon, Ohio. Present, $2.76 per ton; proposed, $2.30 per ton.

10699. Sand, burnt or refuse foundry. Cleveland to Sandusky, Ohio. Present, $1.40 per net ton; proposed, $1 per net ton.

10700. Sand and gravel. Urbana, Ohio, to Moulton and St. Marys, Ohio. Present, 13½ cents; proposed, 80½ cents per net ton.

10701. Crushed stone. Blanchard and Kenton, Ohio, to Pottersburg, Ohio. Present, 80 cents per net ton; proposed, 70 cents per net ton.

10703. Stone, broken, crushed, in bulk, and screenings in bulk. Chewton and Rock Point, Penn., to Shippenville, Penn. Present, 21½ cents; proposed, $1.51 per 2000 lb.

10712. Slag, furnace. Cadillac, Mich., to Chicago, Ill. Present, $5.10 per net ton; proposed, $2.50 per net ton.

10722. Stone dust. Piqua, Ohio, to Louisville, Ky. Present, 22 cents; proposed, $2.30 per net ton.

10726. Sand and gravel. Sandusky, Ohio, to Massillon, Ohio. Present, $1.10 per net ton; proposed, $1 per net ton.

10727. Crushed stone. Chicago to Kimmell, Ind. Present, $1.28 per net ton; proposed, $1.13 per net ton.

10714. Crushed stone. France Quarries, Ohio, to Chagrin Falls, Ohio. Present, 18½ cents; proposed, $1.10 per net ton.

10730. Crushed stone and crushed stone screenings. Bluffton, Ind., to Richmond, Ind. Present, 14 cents; proposed, 90 cents per net ton.

10736. Crushed stone and crushed stone screenings. Bluffton, Ind., to New Castle, Ind. Present, 88 cents per net ton; proposed, 80 cents per net ton.

10744. Crushed stone. Carey, Ohio, to Glouster, Ohio. Present, 18½ cents; proposed, $1 per net ton.

10746. Crushed stone, slag and gravel. Joliet and Plainfield, Ill., to Bremen. Ind. Present, $1.38 per net ton; proposed, $1.01 per net ton.

Southern Freight Association Docket

20596. Sand. Carloads, minimum weight 100,000 lb. from Talbird Siding, N. C., to Rock Hill, Newport, Tirzah and York, S. C. Combination rates now apply. Proposed, to Rock Hill, $1.44; Newport and Tirzah, $1.49; York, $1.53 per net ton. Proposed rates are same as applicable in the reverse direction.

20600. Sand and gravel. Carloads, from Estill Springs and Sewanee, Tenn., to points named below. It is proposed to establish the following reduced rates: To Athens, Tenn., $1.44; to Clinton, Tenn., $1.67; Niota, Tenn., and Reagan, Tenn., $1.49 per net ton. Proposed rates being based on the proposed Georgia scale less 10%.

Illinois Freight Association Docket

3179. Sand and gravel and crushed stone. Carloads, minimum weight 90% of marked capacity of car, but not less than 40,000 lb., i. e.:

From—Joliet, Ill., to Galva, Ill., (1) $1.26, (2) $1.38, (3) $1.26, (4) $1.90; to Lafayette, Ill., (1) $1.26, (2) $1.28, (3) $1.26, (4) $1.90; to Dunlap, Ill., (2) $1.26, (3) $1.26, (4) $1.51; to Toulon, Ill., (1) $1.26, (2) $1.38, (3) $1.26, (4) $1.90.

From—Ottawa, Ill., to Galva, Ill., (1) $1.14, (2) $1.26; to Lafayette, Ill., (1) $1.14, (2) $1.26; to Toulon, Ill., (1) $1.14, (2) $1.26.

(1) Proposed rates on sand and gravel per ton.
(2) Present rates on sand and gravel per ton.
(3) Proposed rates on crushed stone per net ton.
(4) Present rates on crushed stone per net ton.

2183. Crushed stone. Carloads, minimum weight 90% of marked capacity of car, but not less than 40,000 lb. from Moline, Ill., to Ottawa, Ill. Rates in cents per net ton: Present, 113; proposed, 101.

1743. Sand, foundry. Carloads from Ottawa, Ill., to Jackson, Tenn. Present, class rates; proposed, $4.68 per net ton.

Western Trunk Line Docket

1062-D. Sand and gravel. Carloads, from Van Meter, Booneville and Commerce, Iowa, to Princeton, Mill Grove and Trenton, Mo. Present, 11 cents per 100 lb.; proposed, 7 cents per 100 lb. Minimum weight 50,000 lb.

New England Freight Association Docket

8182. Limestone, crude, crushed or ground. Minimum weight 90% marked capacity of car, except when loaded to visible capacity, actual weight to apply, from and to Middlebury, Vt., to and from Brandon, Vt., 85 cents net ton. Reason, to enable shippers to forward out from Brandon or Middlebury mixed carloads of different colored limestone.

8183. Molding sand. Minimum weight 90% of marked capacity of car, except when car is loaded to cubical or visible capacity actual weight will apply, from Van Hoesen, N. Y., to Green Island and Troy, N. Y. Reason, to place rate on a comparable basis with rate to contiguous territory.

8223. Granite, rough quarried. Minimum weight 60,000 lb., from New London, Conn., to Bethel, Vt., to apply on granite for manufacture and reshipment via Central Vermont Ry. Reason, to enable the manufacturers at Bethel to compete for contract on building in New York City.

Southwestern Freight Bureau Docket

4646. Sand. To establish a rate of 13½ cents per 100 lb. on sand, carloads, minimum weight 90% of marked capacity of car from Guion, Ark., to Dewar and Henryetta, Okla. Rates are now in effect, it is stated, from Guion, Ark., to points in the vicinity of Henryetta and Dewar, Okla., and in order to permit movement from Guion, Ark., it is necessary that the same rate be published to Henryetta and Dewar as now in effect to other points located in close proximity thereto.

4673. Sand, gravel and stone. To establish a rate of 6½ cents per 100 lb. to Jolly, Henrietta and Dock Worsham, Texas, and a rate of 7 cents per 100 lb. to Bellevue, Texas, on sand, common; gravel and stone, crushed in straight or mixed carloads, minimum weight marked capacity of car, except when cars are loaded to actual visible loading capacity actual weight shall govern, but in no case less than 50,000 lb. from Richards Spur, Okla. It is stated that the proposed rates are based on the Shreveport scale, the same scale as was approved from Richards Spur, Okla., to Vernon, Wichita Falls, Burkburnett and Electra, Texas.

4691. Stone. To establish a rate of 19½ cents per 100 lb. on stone, rough; stone, broken, crushed or ground; blocks, pieces or slabs, domestic quartzite. Carloads, minimum weight 36,000 lb. from Jasper, Minn., to Dewey, Okla. The above basis, it is stated, has been proposed for application to points in the Kansas Gas Belt and it is desired to establish the same basis to Dewey, Okla.

New Texas Cement Rates

PURSUANT to public hearing, the Texas Railroad Commission adopted the following carload rates on cement, effective June 8, to all stations on the Vernon and Quanah branches of the Frisco, also to Chillicothe, on the Fort Worth and Denver: From Harrys and Eagle Ford, 20½ cents per 100 lb., from Fort Worth via Forth Worth and Denver City Ry., 20½ cents and from Cementville and El Paso 25 cents.—*Dallas (Texas) News.*

Georgia Ground Limestone Rate Revised

THE Georgia Public Service Commission issued an order recently generally revising freight rates on ground or pulverized limestone on intrastate hauls to become effective June 1. This order is a part of the general investigation of all rates which the commission began in 1921.

The following table gives these revised commodity rates on intrastate hauls in cents per 100 lb., carload, minimum weight, 50,000 lb.:

Distance	1	2	3	4	5
5 miles and under	3	......	......	3.5	.....
10 miles and over 5	3	4	4.5	3.5	4.5
20 miles and over 10	3.5	4.5	5	4	5
30 miles and over 20	4	5	5.5	4.5	5.5
40 miles and over 30	4.5	5.5	6	5	6
60 miles and over 40	5	6	6.5	5.5	6.5
80 miles and over 60	5.5	6.5	7	6	7
100 miles and over 80	6	7	7	6.5	7.5
120 miles and over 100	6.5	7.5	8	7	8
150 miles and over 120	7	8	8.5	7.5	8.5
180 miles and over 150	7.5	8.5	9	8	9
210 miles and over 180	8	9	9	8.5	9.5
240 miles and over 210	8.5	9.5	9.5	9	10
280 miles and over 240	9	10	10	9.5	10.5
320 miles and over 280	9.5	10	10	10	10.5
360 miles and over 320	10	10.5	10.5	10.5	11
400 miles and over 360	10.5	11	11	11	11.5
440 miles and over 400	11	11.5	11.5	11.5	12
460 miles and over 440	11.5	12	12	12	12.5

1. To single line application between points located on each of severally named railroads in Freight Tariff Class A.
2. To joint line application on two or more railroads in Freight Tariff Class A.
3. To joint line application between points in the state located on one or more Freight Tariff Class A railroads. Also between points located on one or more Freight Tariff Class A railroads, when the short line distance is constructed in connection with a Class B railroad, and the rate is lower than provided for in application of rates in columns 1 or 2. Also between points on one or more Class B railroads, when the short line distance is constructed in connection with a Class A railroad, and the rate is lower than provided for in the application of rates shown in column 4 or 5.
4. To single line application between points on each of railroads named in Freight Tariff Class B.
5. To joint line application between points located on two or more railroads named in Freight Tariff Class B.

Rates on Gypsum Rock Suspended

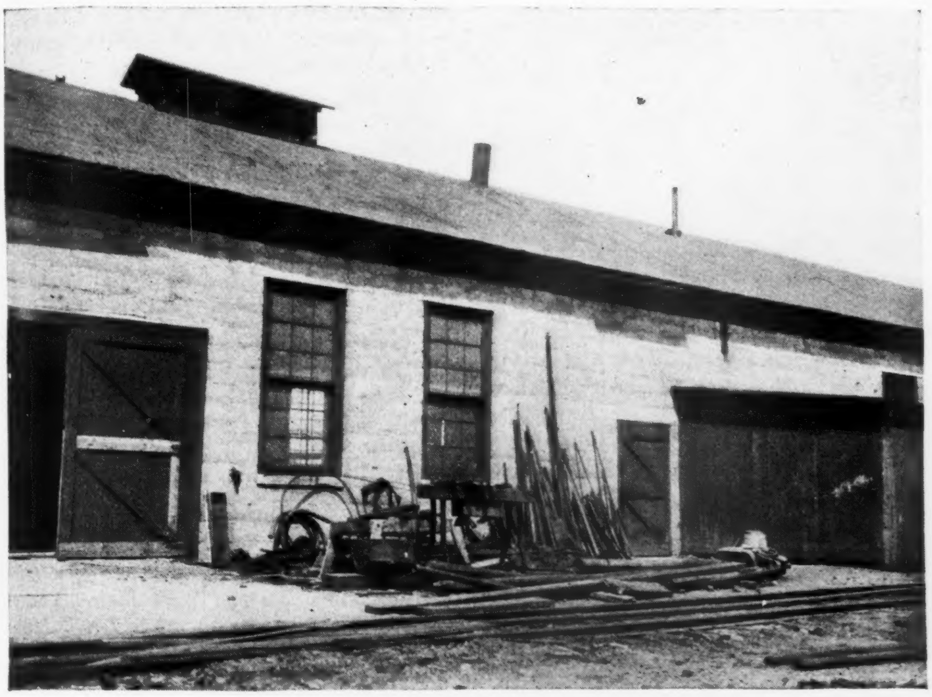
THE Interstate Commerce Commission has suspended until September 12 certain schedules on plaster gypsum rock in carloads from various central freight classification points, including Grand Rapids, Mich., to Canada.—*New York Wall Street Journal.*

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Concrete Blocks for Permanence

THE picture is that of a machine shop and blacksmith shop at the plant of the General Crushed Stone Co., near Akron, N. Y. It was built in 1907 by the Kelley Island Lime and Transport Co. before this company sold the plant and quarry to the present owners.



As good as new after 18 years of exposure to the weather

There is nothing particularly remarkable about the building except that it was built at a time when concrete block were very little made as compared to the present production. Examples of concrete products structures as old as this are not very common, so they are interesting as showing the permanence of such structures.

The walls were carefully examined by a Rock Products representative who visited the plant recently. They appear as sound and firm as if they were put up yesterday despite the fact that they have been exposed to the weather for 18 years. There are no signs of cracking or scaling. These block must have been honestly made of good material.

Such examples as this are the best sales argument the concrete products man can use, especially when concrete blocks are being introduced in new localities.

Effect of Flat Particles in Concrete Aggregate

J. B. WATSON, assistant engineer of the Pennsylvania R. R., writes in *Railway Engineering and Maintenance* on the effect of flat particles in congregate aggregate as follows:

"In general, any change in aggregate from a spherical shape tends to make concrete less workable, assuming that the same quantities of water, cement, sand and aggregate are used. Workability is the property of concrete which may be thought of as flowability or the quality that makes puddling possible so as to form a homogeneous mass, to avoid honeycombing or bridging. Naturally the spherical particles are more easily moved because of their rounded shapes, while particles with flat surfaces have an opposite tendency in some ratio to their flat surfaces.

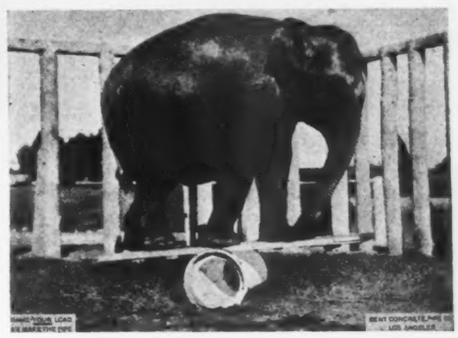
"The lack of workability can be overcome by decreasing the volume of coarse aggregates and using the same quantities of water, cement and sand to maintain the same strengths. This decrease in volume of the loose coarse aggregate may run from 10 to 40%, depending on the shape and surfaces of the aggregate and their grading.

"The reverse could also apply by maintaining the same proportion of coarse aggregate and increasing the quantity of water, cement and sand, it being borne in mind that the maintenance of the same ratio of the volume of water to the volume of cement is necessary to obtain the same strengths. The volume of the water in both the fine and coarse aggregates should be taken into account and considered as a part of the water in determining the so-called water-cement ratio.

A compromise between these methods would probably be more economical in most cases, that is, workability could be obtained by increasing the sand and decreasing the coarse aggregate and adjusting the water and cement to maintain the same ratio of water to cement.

Elephant Tests a Concrete Sewer Pipe

WHILE recently visiting the San Diego, Calif., zoo in company with his friend the keeper, the thought occurred to Ernest Bent, technician and president of the Bent Concrete Pipe Co., Los Angeles, Calif., that he would like to load 7000 lb. of elephant onto a section of his 15-in. concrete sewer pipe. After a stockade of sections of this



An expensive test but a good advertisement

pipe filled with concrete had been constructed, the elephant was invited to walk the plank, with results as shown in the accompanying view.

The standard requirement for this piece of pipe is 5000 lb.

The makers of cement products in California are wide-awake advertisers, as the many reports of test fires and other "stunts" that have been published signify. In this case there is a convincing proof of the strength of the pipe that a picture of weights or sand bags would never have.

Success in Making Concrete Products

Address of E. W. Deinhart, of the Acme Concrete Products and Gravel Co., Cement City, Mich., Before the Concrete Products Division of the National Sand and Gravel Association

[Few men have gone into the cement products industry with the same equipment as that possessed by E. W. Dienhart. His work with W. D. M. Allen, when both were with the Portland Cement Association, resulted in an annual saving of thousands of dollars to the makers of concrete brick, block and tile. Mr. Dienhart, as told in the February 7 issue is now in the concrete products business himself and is applying his knowledge not only to making better concrete products but to producing a special aggregate for other concrete products makers which will reduce the cost of manufacture by cutting down the cement needed for the required strength of concrete.—The Editors.]

IN the concrete brick industry there have been a multitude of tests made which show conclusively that the efficiency of concrete brick when laid up into walls is very much higher than the efficiency of clay brick when laid up into walls; for example, it has been shown, by tests both at Columbia University and at the Bureau of Standards that clay brick when laid up into a wall will only develop approximately 30% of the strength of the individual clay brick; that is a clay brick of about 2000 lb. strength per square inch can only be expected to provide a wall or pier which will have a strength of 30% of this or 600 lb. per square inch.

Tests made by individual research laboratories show that you can expect 65 to 70% efficiency out of concrete bricks when they are laid into walls. That is the kind of stuff that is putting concrete products over. You will find shortly that those things are going to be acknowledged, although it is hard to get a building code compiler or an engineer to say right off the bat, "Well, all right; we will let you calculate your stresses on that basis."

A big start has been made, however. The Hoover Building Code Committee, which has just completed the drafting of a standard building code, a suggested building code to correlate and make uniform the various building codes of the country, has allowed a higher working stress on concrete masonry than on clay brick masonry for units of the same strength; or, put in another way, it permits a lower strength concrete brick, where it demands a much higher strength clay brick.

All business success in our industry goes back to confidence. If you have not confidence in the product, there is only one way you can get it. You have got to see what has been done with concrete products; you have got to visit concrete pipe plants, for instance, if you are interested in pipe and think it is the thing for your field, pipe plants like that in Beloit, the plant at New Orleans, at Saginaw, Mich., or one of the others scattered through the country.

If you are interested in building products, you have got to go through the east, through Philadelphia and New England, down to Florida, and see what they are doing with concrete products there. In Florida today, the standard type of construction is the stucco on either concrete block or concrete tile, and that is what we have to introduce as a standard type of building construction throughout the country.

In and around Philadelphia, some of the most beautiful homes are built of that type of construction. Senator Edge, of New Jersey, has built a beautiful place at Atlantic City, on the board walk, made of stucco concrete building tile, and there are many other notable examples. In Philadelphia there are probably 12 or 15 concrete brick plants producing millions of brick daily. One plant alone has an output of 125,000 a day.

Studying the Field

You have really got to study the whole field. Then you have got to study your own local field and compare it to the fields in which these products have proven successful. Take the question of making concrete brick. You can't make concrete brick today in any part of the United States that you may choose. In this city right here, (Chicago) it would be absolutely impossible to make and sell concrete brick profitably. Clay brick in this market is selling at probably the lowest price of any market in the country, and the cost of the concrete product would not warrant going into a market where clay brick is as firmly entrenched as it is here.

Now that applies to many localities. I should preface that by saying that this is true of common brick, and not of face brick. When you consider face brick you have a different proposition, but as far as common brick goes there is not much chance of competing in fields where the clay brick interests are firmly entrenched, and particularly in those cities where they are still making common clay brick at home.

The reason that concrete brick is doing so well in the east is this: The clay brick plants there have been longest established. They originally had deposits right in town. The city has grown up and grown around them. They have exhausted their original deposits now and the plants have been forced into the country. Well, the minute clay brick makers are forced to spend $4 to $5 a thousand in freight, you have got them pretty well whipped with a local concrete brick plant right in the heart of town.

The thing that our company is going to specialize on is a concrete building tile. The market that we ship into, Detroit and the surrounding territory, is already sold on concrete products. Concrete building tile is made there by the millions today, and we are going into a market that is pretty well established. We have got to build up and develop the territory immediately surrounding us on the strength of what has been done in Detroit, which has been used as a sample for concrete building tile all over the country. I have personally had contracts for many jobs in the south which have been awarded for concrete building tile on the strength of letters, recommendations and photographs which we have had of structures in Detroit. Of course, that ought to be of advantage to us, inasmuch as we are very close to that market.

Building Tile

This tile is a unit that is comparable in size to the standard clay building tile, and it is one which we can make at less cost, with regard to load bearing tile, and it is one that has a good many superior qualities as compared with clay buildng tile.

One outstanding example of that was shown when we built our curing rooms. They have walls 75 ft. long, 8 in. thick, one tile thick, and average 7 ft. high. Those walls are just as straight as a die on both sides. With only clay products you never could do that. You would have to build flush to a line, either on one side of the wall or the other and let the other side come where it will, because the variation in thickness will often be as much as a quarter of an inch. It is a very big point in favor of concrete tile and there are other points as well.

There are a lot of other products that can be made commercially. There are silo staves and roofing tile, in addition to concrete and face brick, and architectural trim stone. Architectural trim stone is not the product for the sand and gravel or crushed stone producer to get interested in, however, because it is a highly developed article. It requires the services of molders and patternmakers, and all that sort of thing, but all these other ordinary building products that consume aggregates are the ones you should be interested in; products like brick, sewer pipe, building tile and concrete block.

I presume a great many of you are familiar with the extended research work which the Portland Cement Association has

carried out on concrete through the laboratory they maintain in conjunction with the Lewis Institute in Chicago. At that laboratory they have spent hundreds of thousands of dollars to learn the facts about concrete, and they have quite definitely established the factors that influence the strength and other properties of concrete. That is true as regards concrete used in structures like bridges, pavements, roads, reinforced concrete pavements (any type of concrete which employs a relatively wet mix) but it is not true of the type of concrete generally used for making concrete products, that of a semi-wet consistency, or as it is often termed, a dry consistency. In the laboratory they had no means of making tests of concretes which were dry and would not flow readily into place except under pressure, by tamping as we make concrete products.

So we adopted a schedule of tests which were conducted in plants throughout the country. I believe the thing that started it and put the idea firmly before me was the work which Mr. Allen and I did in conducting fire tests on concrete products for the Portland Cement Associaton. When it came to making specimens for these tests, we saw at once it was necessary to effect some sort of manufacturing procedure which would guarantee a uniform product, and one that we could call representative of concrete products, and incidentally one of which we had the entire history. We had to know what materials were in there, their grading, the composition, the amount of water and all that entered into the making of that concrete. We tested some of the specimens we made at the time for strength and absorption and the results which we got from those specimens convinced Mr. Allen and myself that there was a great field for research work in the direction of grading aggregates and showing products manufacturers where they could effect economies by the grading of aggregate. I might explain that Mr. Allen was then the assistant manager of the Cement Products section of the Portland Cement Association and I was under him as his assistant. We are both out now.

Saving the Producer Money

As a result of that work, we went into the field and made tests at half a dozen different points on various products, and we got information that was very gratifying and quite amazing indeed, and all that material is available to you who are interested, directly from the Portland Cement Association.

For instance, we went into the situation in Philadelphia. They were making a very poor quality of concrete products. The particular plant we went to was using a 1 to 6 mix and had difficulty in making a product that would stand a compressive strength of 1000 lbs. per sq. in. As a result of our work we showed those manufacturers where they could use a mix as lean as 1 to 9 or 1 to 10 and get a strength which would meet the requirements of 1500 lbs. to the sq. in., so you see we got half again as much strength as they were getting, with about one-half the cement.

In Prairie du Chien, Wisconsin, we made tests on concrete building tile, and we showed that manufacturer where just by changing his aggregate grading he could save $6 a thousand on the cost of making concrete building tile. That was more money than the manufacturer had ever netted out of his plant. The same work has gone on, and right now there is plenty of data available if the manufacturers of concrete products will only study it.

As producers of sand and gravel we have got to study those things and we have got to put our house in order and produce the kind of materials that are going to permit of those economies in making products. I imagine a good many of us have customers, concrete products manufacturers, on whom we like to palm off that which we can not get rid of to anybody else, the extreme fines, and the products manufacturer is satisfied to buy that because he doesn't know any better, but times are changing and the time is not far distant when the manufacturer is going to tell the producer what he wants in the way of aggregate, and it will be up to him to furnish it because he can get a price for it.

Grading of Aggregates a Science

I have a program tentatively outlined now where our company is going to produce the kind of aggregates concrete products makers need, and it is going to give us a real price for our product that is of lowest value, and that is sand. It is going to make a market for sand. Now to get that market for sand, we have got to add some gravel, and it usually gives a great deal of satisfaction to highway officials when you tell them you are willing to take some of the pea gravel out of your sand. I don't know how most of your deposits run, but I know it certainly helps ours to take out a good percentage of the pea gravel, and that is the very stuff that makes money for us, because it is what we want for making concrete products aggregate.

The grading of aggregates is now down to a science. We can determine beforehand very well the strength of concrete that will be obtained from a given mix of cement if we know the grading of the aggregate. The grading of the aggregate has a value that is determined by the fineness modulus, which means nothing more nor less than a measure of the grading of the aggregate, and by applying that term to the amount of cement and certain other factors, which can be readily done by anybody, we can predetermine the strength of the concrete. The tests which have been conducted show that the higher the fineness modulus up to a certain limit, the higher the strength of concrete with a given amount of cement.

It works this way: the average sand that you find over the country has a fineness modulus close to 3; the average pea gravel that you will find over the country has a fineness modulus of about 6. Then by combining those two in various proportions, you arrive at certain other values of fineness modulus. For instance, 50% sand and 50% pebbles figures out to a 4.50 fineness modulus. One-half of three and one-half of six, gives you 4.50. There are tables for figuring all that which you can get and have them handy. That grading of half sand and half pea gravel (the 4.50 fineness modulus) can be made up of different proportions of fine and coarse aggregates depending upon the grading. For instance if a sand producer has a sand that grades only 2.50 fineness modulus, he must use more coarse aggregate than the man that has sand with a modulus of 3, in order to get the combined fineness modulus of 4.50. It works out easily, and the big point is this, our tests show as a general thing that for a given mix in the proportions usually used, concrete products that use an aggregate of 4.50 fineness modulus, or approximately one-half sand and one-half pea gravel, are 100% higher in strength than products with straight sand. Now you can see what that means in the value of pea gravel to concrete products manufacturers, and we have got to be prepared to give them some of that with sand in order to effect a good market for sand.

I would suggest that you who seriously contemplate going into the concrete products business go to the Cement Association office, and get some of that information from them. It is available and they are glad to give it to you, and they have got a lot of other information on costs of installing plants and operation and methods of handling products, and all that sort of thing, and you will get a real insight into the possibilities of the business, and then, of course, their promotional literature is unexcelled.

The fineness modulus of 4.50 I have used for illustration is just a little coarse. I took 4.50 because I used 3 and 6 and it worked out that way. I like 4.25 a little better for tile, but the fineness modulus to use varies according to product. If you are making a product with a thick wall and lots of concrete in it like a concrete block, you can easily use a fineness modulus up to 4.75. In a tile with a thin wall, you must necessarily use a smaller maximum sized aggregate for workability and for appearance of the finished product, so 4.25 would do for that, which would also be true of sewer pipe and silo staves and such products as that. When you get down into concrete roofing tile, where you have a very thin slab, probably not over ⅜-in. or ½-in. in thickness, you have got to cut down your maximum size even more, you couldn't use ½-in. aggregate; you would have to depend on your sand and build up a good grading of sand, trying to get the best grading available.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	1.00	....	1.75	1.50	1.50	1.50
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Munns, N. Y.	1.00	1.40	1.30	1.25	....	....
Northern New Jersey	1.60	1.80	1.80	1.40	1.40	....
Prospect, N. Y.	1.00	1.40	1.40	1.30	1.30	....
Watertown, N. Y.	....	.50	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alton, Ill.	1.85	....	1.85	1.75	....	....
Bloomville, Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.00	1.00	1.00
Buffalo and Linwood, Iowa	1.10	1.20	1.20	1.00	1.05	1.05
Chicago, Ill.	.80	1.00	1.00	1.00	1.00	1.00
Columbia, Krause, Valmeyer, Ill.	1.20	1.20	1.20	1.10	1.10	1.10
Cypress, Ill.	1.25	1.15	1.10	1.10	1.10	1.10
Dundas, Ont.	.70	1.05	.90	.90	.90	90
Gary, Ind.	1.00	1.37½	1.37½	1.37½	1.37½	1.37½
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.95	.95	.95
Northern New Jersey	1.30	....	1.80	1.60	1.40	....
River Rouge, Mich.	1.00	1.10	1.10	1.10	1.10	1.10
Sheboygan, Wis.	1.10	....	....	1.10	1.10	....
St. Vincent de Paul, Que.	.85	1.35	1.05	.95	.90	.90
Stone City, Iowa	....	....	1.20†	1.10	1.05	....
Toronto, Ont.	1.60	1.95	1.80	1.80	1.80	1.80
Waukesha, Wis.	.90	.90	.90	.90	.90	.90
Wisconsin Points	.50	1.00	....	.90	.90	....
Youngstown, Ohio	....	....	....	1.50	1.60	1.60
SOUTHERN:						
Alderson, W. Va.	.60	1.60	1.60	1.50	1.40	....
Bridgeport and Chico, Texas	1.00	1.35	1.25	1.25	1.20	1.10
Cartersville, Ga.	1.75	1.50	1.50	1.35	1.35	....
El Paso, Texas	1.00	1.00	1.00	1.00	1.00	....
Ft. Springs, W. Va.	.60	1.60	1.60	1.50	1.40	....
Graystone, Ala.	Crusher run fluxing stone, 1.00 per net ton					
Olive Hill, Ky.	1.00	1.00	1.00	1.00	1.00	1.00
Rockwood, Ala.	1.00			1.25	1.00	
WESTERN:						
Atchison, Kans.	.25	2.00	2.00	2.00	2.00	1.60‖@1.80
Blue Spr'gs & Wymore, Neb.	.20	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	....	1.25	1.25	1.00	....
Kansas City, Mo.	1.00	1.65	1.65	1.65	1.65	1.65
Rock Hill, Mo.	1.50	....	1.25	1.25	1.25	1.25

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.70	1.45	1.20	1.05	....
Duluth, Minn.	.90	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.75	1.75	1.75	1.75	1.75	....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
New Haven, New Britain, Meriden & Wallingford, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.50@1.75	2.00@2.25	1.50@1.80	1.40@1.70	1.40@1.60	....
Oakland and El Cerrito, Calif.	1.75	1.75	1 75	1.75	1.75	....
San Diego, Calif.	1.45	....	1.65	1.30	1.30	1.25
Sheboygan, Wis.	1.00	1.10	1.10	1.10	1.10	....
Springfield, N. J.	1.75	2.10	2.10	1.70	1.60	1.50
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley and Red Granite, Wis.—Granite	1.50	1.60	1.35	1.25	1.25	1.00
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Columbia, S. C.—Granite	.50	2.00	1.75	....	1.60	....
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.	.75	....	1.75b	1.25	1.25	....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	....
Middlebrook, Mo.—Granite	3.00@3.50	....	2.00@2.25	2.00@2.25	....	1.25@2.00
Northern New Jersey (Basalt)	150	2.00	1.80	1.40	1.40	....
Richmond, Calif. (Basalt)	.75*	....	1.50*	1.50*	1.50*	....

*Cubic yd. †1 in. and less. ‖Rip rap per ton. (a) Sand. (b) to ¼ in. (c) 1 in., 1.40. (d) 2 in., 1.30.

Agricultural Limestone
(Pulverized)

Alton, Ill. — Analysis, 97% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh		6.00
Pulverized		1.85
Asheville, N. C. — **Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk**		2.75
Branchton, Penn. — 100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)		5.00
Cape Girardeau, Mo.—Analysis, 93.5% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh		1.50
Cartersville, Ga. — **Analysis, 68%** $CaCO_3$, 32% $MgCO_3$; pulverized		3.00
50% thru 100 mesh		1.75
Chaumont, N. Y. — **Pulverized limestone, bags, 4.00; bulk**		2.50
Chico, Texas—Pulverized		2.50
Colton, Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk		4.00
Dundas, Ont., Can.—Analysis, 53.80% $CaCO_3$, 43.31% $MgCO_3$; 35% thru 100 mesh, 50% thru 50 mesh, 100% thru 10 mesh; bags, 4.75; bulk		3.00
Hillsville, Penn. — **Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, $5.00; bulk**		3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk		2.50
Knoxville, Tenn.—**80% thru 100 mesh,** bags, 3.95; bulk		2.70
80% thru 200 mesh, bags, 4.25; bulk		3.00
Linville Falls, N. C.—Analysis, 57% **$CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk**		2.75
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% **thru 10 mesh; 80 lb. paper sacks,** 5.10; bulk		3.60
Marion, Va. — **Analysis, 90% $CaCO_3$, 2% $MgCO_3$; 42.5% thru 100 mesh, 11.3% thru 80, 20.2% thru 60, 22.8% thru 40, 3.2% thru 20 and under or 75% thru 40 mesh; pulverized, per ton**		2.00
Mayville, Wis.—Analysis, 54% $CaCO_3$, **44% $MgCO_3$; 90% thru 100 mesh**	3.90@	4.50
Mountville, Va.—Analysis 76.60% $CaCO_3$, 22.83% $MgCO_3$; 50% thru 100 mesh, 100% thru 20 mesh—125-lb. hemp bags		5.00
Olive Hill, Ky.—90% thru 100 mesh		2.00
90% thru 4 mesh		1.00
Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. **(Less 50 cents commission to dealers)**		5.00
Piqua, Ohio—**Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100**	2.50@	2.75
100% thru 10, 90% thru 50, 80% **thru 100; bags, 5.10; bulk**		3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk		5.50
Waukesha, Wis.—Pulverized		4.00
Watertown, N. Y.—Analysis 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk		2.50
West Stockbridge and Rockdale, Mass., Danbury, Conn. — Analysis, 90% $CaCO_3$, 5% $MgCO_3$; 50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk		3.25

Agricultural Limestone
(Crushed)

Alderson, W. Va. — Analysis, 90% $CaCO_3$; 50% thru 100 mesh	1.50
Bedford, Ind. — Analysis, 97.5% $CaCO_3$, 1.2% $MgCO_3$; 95% thru 100 mesh, 65% thru 40 mesh, 30% thru 100 mesh	1.50
Bettendorf, Iowa — 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Blackwater, Mo.—99% $CaCO_3$; 90% thru 4 mesh	1.00
Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.75
50% thru 4 mesh	1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page)

Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh		.80
Chico, Texas — 50% thru 50 mesh, 50% thru 4 mesh		1.00
Columbia, Krause, Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 90% thru 4 mesh		1.20
Cypress, Ill.—90% thru 100 mesh		1.25
50% thru 100 mesh, 90% thru 50 mesh, 50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh		1.15
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh		1.50
Garrett, Okla.—All sizes		1.25
Gary, Ill. — Analysis, approx. 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 4 mesh		.60
Kansas City, Mo.—50% thru 100 mesh		1.25
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh		2.00
Screenings (¼ in. to dust)		1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk		1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@	2.35
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind. — Analysis, 42% $CaCO_3$, 54% $MgCO_3$; meal, 25 to 45% thru 100 mesh		1.60
Milltown, Ind. — Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$; 30.8% thru 100 mesh, 38% thru 50 mesh	1.45@	1.60
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh		1.50
Pixley, Mo.—Analysis, 96% $CaCO_3$; 50% thru 50 mesh		1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh		1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@	1.40
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh		.75
Waukesha, Wis.—Test, 107.38% bone dry, 100% thru 10 mesh; bags, 2.85; bulk		2.10

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk		3.00
Piqua, Ohio, sacks, 4.50@5.00 bulk	3.00@	3.50
Waukesha, Wis.—97% thru 100 mesh, bulk		4.00

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton.

Glass Sand:		
Berkeley Springs, W. Va.	2.00@	2.25
Cedarville and S. Vineland, N. J.—		
Damp		1.75
Dry		2.25
Cheshire, Mass.:		
6.00 to 7.00 per ton; bbl.		2.50
Columbus, Ohio	1.50@	2.00
Estill Springs and Sewanee, Tenn.		1.50
Gray Summit and Klondike, Mo.		2.00
Los Angeles, Calif.—Washed		5.00
Mapleton Depot, Penn.	2.00@	2.25
Massillon, Ohio		3.00
Mineral Ridge and Ohlton, Ohio		2.50
Oceanside, Calif.		3.00
Ottawa, Ill.—Chemical and mesh guaranteed		1.50
Pittsburgh, Penn.—Dry		4.00
Damp		3.00
Red Wing, Minn.:		
Bank run		1.50
Ridgway, Penn.		2.50
Rockwood, Mich.	2.75@	3.25
Round Top, Md.		2.25
San Francisco, Calif.	4.00@	5.00
St. Louis, Mo.		2.00
Sewanee, Tenn.		1.50
Thayers, Penn.		2.50
Utica, Ill.	1.00@	1.35
Zanesville, Ohio		2.50
Miscellaneous Sands:		
Aetna, Ind.:		
Core, Box cars, net, .35; open-top cars		.30
Albany, N. Y.:		
Core		1.25
Molding coarse		2.00
Molding fine, brass molding		2.25
Sand blast		4.00
Arenzville and Tamalco, Ill.:		
Molding fine and coarse	1.40@	1.60
Brass molding		1.75
Beach City, Ohio:		
Core		1.75
Furnace lining		2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f. o. b. producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.75	.75	.85	.75	.75	.75
Buffalo, N. Y.	1.10	.95	.85	.85	.85	.85
Erie, Penn.		1.25		1.50	1.75	
Farmingdale, N. J.	.58	.48	1.05	1.20	1.10	
Hartford, Conn.	.65*					
Machias Jct., N. Y.		.75	.75	.75	.75	.75
Montoursville, Penn.	1.00@1.10	1.10@1.25		.85	.75	.75
Northern New Jersey	.50	.50	1.35	1.25	1.25	
Olean, N. Y.		.90	.75	.75	.75	.75
Shining Point, Penn.			1.00	1.00	1.00	1.00
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.—Rewashed, river	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Attica, Ind.	.75	.75	.75	.75	.75	.75
Barton, Wis.		.60	.80	.80	.80	.80
Chicago, Ill.	1.35	1.75	1.75	1.75	1.75	1.75
Columbus, Ohio	.75	.75	.75	.75	.75	.75
Covington, Ind.	.75	.75	.75	.75	.75	.75
Des Moines, Iowa	.50	.40	1.50	1.50	1.50	1.50
Eau Claire, Wis.	.60@ .80	.40	.80			.85
Elkhart Lake, Wis.	.60	.40	.60	.60	.60	.60
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Grand Rapids, Mich.		.50		.80	.70	.70
Hamilton, Ohio		1.00			1.00	
Hersey, Mich.		.50				.70
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.45@ .55	.45@ .55	1.35@1.45	1.45@1.55	1.40@1.50	1.35@1.45
Mankato, Minn.		.40	.40a		1.25	
Milwaukee, Wis.		1.01	1.21	1.21	1.21	1.21
Minneapolis, Minn.*	.35	.35	1.35	1.25	1.25	1.25
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.45@ .50	.45@ .50		1.25	1.25	
Palestine, Ill.	.75	.75	.75	.75	.75	.75
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
Summit Grove, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.60	.90	.90	.85	.85
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.55	.60	.65	.65
Winona, Minn.	.40	.40	1.25	1.10	1.00	1.00
Yorkville, Sheridan, Oregon, Moronts, Ill.	Average .40@.60					
Zanesville, Ohio	.70	.60	.60	.60	.90	.90
SOUTHERN:						
Charleston, W. Va.	All sand 1.40 f.o.b. cars. All gravel 1.50 f.o.b. cars.					
Chehaw, Ala.	00@ .30		.40	.50		
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.00
Macon, Ga.	.50		.75		.65	.65
New Martinsville, W. Va.	.90@1.00	.90@1.00		1.20		.80@ .90
Roseland, La.	.80	.70	1.50	1.50	1.25	1.25
Smithville, Texas		.90	.90	.90	.90	.75
WESTERN:						
Baldwin Park, Calif.	.20	.20	.40	.50	.50	
Kansas City, Mo.	.80	.70				
Los Angeles, Calif.	.50	.50	.92	.92	.92	
Los Angeles District (bunkers)†	.80	1.30	1.30	1.30	1.30	1.30
Pueblo, Colo.	1.10*	.90*		1.60*		1.50*
San Diego, Calif.	.60	.60	1.20	1.20	1.00	1.00
Seattle, Wash. (bunkers)	1.50*	1.50*	1.50*	1.50*	1.50*	1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.	Dust to 3 in., .40					
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Chehaw, Ala.	00@ .30					
Des Moines, Iowa	Washed, .65; unwashed, .40 (not screened)					
Dudley, Ky. (crushed silica)		1.10		.90		
East Hartford, Conn.	Sand, .65 per cu. yd.					
Elkhart Lake, Wis.	.50					
Gainesville, Texas		.95				.55
Grand Rapids, Mich.				.60		
Hamilton, Ohio					.70	
Hersey, Mich.				.55		
Indianapolis, Ind.	Mixed gravel for concrete work, .65					
Lindsay, Texas						.55
Macon, Ga.		.35				
Mankato, Minn.	Pit run gravel, .50					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Montezuma, Ind.						.60
St. Louis, Mo.	Mine run gravel 1.55 per ton					
Shining Point, Penn.	Concrete sand, 1.10 ton					
Smithville, Texas	.50	.50	.50	.50	.50	.50
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waukesha, Wis.	.60	.60	.60	.60	.60	.60
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Penn.	1.10	1.00				
Zanesville, Ohio						.55

*Cubic yd. †Include freight and bunkerage charges (a) ¾ in. down. (b) River run.

Miscellaneous Sands

(Continued from preceding page)

Molding fine and coarse		2.00
Traction unwashed and screened		1.75
Cheshire, Mass.—Furnace lining, molding fine and coarse		5.00
Sand blast	5.00@	8.00
Stone sawing		6.00
Columbus, Ohio:		
Core	.30@	1.50
Traction	.30@	.90
Molding coarse	1.25@	1.50
Furnace lining	1.75@	2.00
Stone sawing		1.50
Brass molding	2.00@	2.25
Sand blast	3.50@	4.50
Dresden, Ohio:		
Core	1.25@	1.50
Molding fine	1.50@	1.75
Molding coarse		1.50
Traction		1.25
Brass molding		1.75
Eau Claire, Wis.:		
Roofing sand		3.00
Sand blast	3.00@	3.25
Stone sawing	2.50@	3.00
Traction, wet, .35; dry		.65
Elco, Ill.:		
Ground silica per ton in carloads	22.00@	31.00
Estill Springs and Sewanee, Tenn:		
Molding fine and core		1.25
Roofing sand, sand blast, traction	1.35@	1.50
Franklin, Penn.:		
Core, molding fine and coarse, brass molding		1.75
Gray Summit and Klondike, Mo.:		
Core		1.75
Molding fine, stone sawing	1.75@	2.00
Joliet, Ill.:		
No. 2 molding sand; also loam for luting purposes and open-hearth work	.65@	.85
Kasota, Minn.:		
Stone sawing (not screened or dried)		1.25
Mapleton Depot, Penn.:		
Molding fine, traction		2.00
Roofing sand		1.50
Massillon, Ohio:		
Molding fine, coarse, furnace lining core and traction		2.50
Michigan City, Ind.:		
Core and traction	.30@	.40
Mineral Ridge and Ohlton, Ohio:		
Molding fine and coarse, traction, furnace lining, all green		1.60
Core, roofing sand, sand blast, stone sawing, all green		1.75
Montoursville, Penn.:		
Core		1.35
Traction	1.10@	1.35
New Lexington, Ohio:		
Molding fine		2.00
Molding coarse		1.50
Oceanside, Calif.:		
Roofing sand		3.50
Ottawa, Ill.:		
Molding coarse (crude silica sand)	.75@	.90
Sand blast		3.50
Stone sawing		1.50
Red Wing, Minn.:		
Core, furnace lining, stone sawing		1.50
Molding fine and coarse, traction		1.25
Sand blast		3.50
Filter sand		3.75
Ridgway, Penn.:		
Core		2.80
Furnace lining, molding fine, molding coarse		1.25
Traction		2.25
Round Top, Md.:		
Core		1.60
Traction		1.75
Roofing sand		2.25
St. Louis, Mo.:		
Core	1.00@	1.75
Furnace lining		1.50
Molding fine	1.50@	2.50

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.35@2.50	1.35@1.70	1.45@1.80	1.35@1.70	1.35@1.70	1.35@1.70	1.35@1.70
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Emporium and Dubois, Penn.	2.35@2.50	1.35@1.70	1.45@1.80	1.35@1.70	1.35@1.70	1.35@1.70	1.35@1.70
Reading, Pa.	2.50	1.00		1.25			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05	1.45		1.45		1.45	
Jackson, Ohio		1.05		1.30	1.05	1.30	1.05*
Toledo, Ohio	1.50	1.25	1.25	1.25	1.25	1.25	1.25
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05	1.55		1.55	1.55	1.55	1.55*
Ensley and Alabama City, Ala.	2.05	.80	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15

*¼ in. to 1½ in.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.20
Buffalo, N. Y.		12.00	12.00	12.00				
Lime Ridge, Penn.							5.00a	
West Stockbridge, Mass.		10.50	5.60					2.25m
Williamsport, Penn.			10.00				6.00	
York, Penn.		10.50	10.50	11.50			8.50	1.65i
CENTRAL:								
Cold Springs, Ohio		10.00	9.00		9.00	11.00	9.00	
Delaware, Ohio	12.50	10.00	9.00	10.50	9.50	1.35	9.00	1.50
Gibsonburg, Ohio	12.50				9.00	11.00		
Huntington, Ind.	12.50@14.50	10.00	9.00		9.00	11.00	9.00	
Luckey, Ohio (f)	12.50							
Marblehead, Ohio	12.50	10.00	9.00	12.00	9.00	11.00	9.00	1.50c
Marion, Ohio		10.00	9.00				9.00	1.70
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.70e
Sheboygan, Wis.							8.50t	
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50							
Woodville, Ohio (f)	12.50	10.00	9.00		9.00	10.50l	9.00	1.50
SOUTHERN:								
Erin, Tenn.							7.80	1.25
El Paso, Texas							9.00	2.00
Graystone, Ala.	12.50	11.00		10.00		1.35u	8.50	1.50
Karo, Va.		10.00	9.00				7.00g	1.65h
Knoxville, Tenn.	20.50	11.00		11.00			8.50	1.50
Varnons, Ala. (f)		10.00p	10.00p				8.00q	1.40r
Zuber and Ocala, Fla.	13.00	11.00	10.00		12.00			1.75
WESTERN:								
Kirtland, N. M.							15.00	
San Francisco, Calif.	20.00†	20.00†	15.00s	20.00†				2.50o
Tehachapi, Calif.							16.20	

†50-lb. paper bags, burlap 24.00; (a) run of kilns; (c) wooden, steel 1.70; (d) wood; (e) per 180-lb. barrel; (f) dealers' prices; (g) to 9.50; (h) to 1.75; (i) 180-lb. bbl.; 2.65, 280-lb. bbl.; (l) 80-lb. paper; (m) finishing lime, 3.00 common; (n) common lime; (o) high calcium, common 1.90; (p) to 11.00; (q) to 8.50; (r) to 1.50; (s) in 80-lb. burlap sacks; (t) in bbls.; (u) two 90-lb. bags.

Miscellaneous Sands

(Continued)

Molding coarse	1.25@	1.75
Roofing sand		1.75
Sand blast	3.50@	4.50
Stone sawing	1.25@	2.25
Traction		1.25
Brass molding	2.00@	3.00
San Francisco, Calif:		
(Washed and dried) — Core, sand blast and brass molding	3.50@	5.00
Furnace lining and roofing sand	3 50@	4.50
Molding fine and traction		3.50
Molding coarse		4.50
(Direct from pit)—Core and molding fine	2.50@	4.50
Sewanee, Tenn.:		
Molding fine and coarse, roofing sand, sand blast, stone sawing, traction, brass molding		1.25
Tamms, Ill.:		
Ground silica per ton in carloads	20.00@	31.00
Thayers, Penn.:		
Core		2.00
Molding fine and coarse		1.25
Traction		2.25
Utica, Ill.:		
Core, furnace lining, molding coarse, stone sawing		.75
Molding fine		.55
Utica, Penn.:		
Core		2.00
Molding fine and coarse		1.75
Warwick, Ohio.:		
Core, molding fine and coarse (green)		1.75
Core, molding fine (dry)		2.25
Zanesville, Ohio:		
Core		1.75
Molding fine, brass molding	1.75@	2.00
Molding coarse	1.50@	1.75

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:		
Crude talc (mine run)	3.00@	4.00
Ground talc (20-50 mesh), bags		10.00
Cubes		55.00
Blanks (per lb.)		.08
Pencils and steel workers' crayons, per gross		1.25
Chatsworth, Ga.:		
Crude		4.50
Ground (150-200 mesh), bags	8.00@	12.00
Pencils and steel workers' crayons, per gross	1.00@	2.00
Chester, Vt.:		
Ground talc (150-200 mesh), bulk	9.00@	10.50
Bags	10.50@	11.50
Chicago, Ill.:		
Ground (150-200 mesh) bags		30.00
E. Granville, Rochester, Johnson, Waterbury, Vt.:		
Ground talc (20-50 mesh) bags	7.00@	10.00
Ground talc (150-200 mesh) bags	10.00@	25.00
Pencils and steel workers' crayons, per gross	.75@	2.00
Emeryville, N. Y.:		
(Double air floated) including bags; 325 mesh (50 lb. paper, 100 & 200 lb. burlap bags)		14.75
Hailesboro, N. Y.:		
Ground (150-200 mesh) bags		18.00
Ground (200-300 mesh) bags		20.00
Henry, Va.:		
Crude talc (mine run)		3.50
Ground talc (150-200 mesh), bags	9.00@	14.50
Joliet, Ill.		
Ground (200 mesh), bags		30.00
Keeler, Calif.:		
Ground (200-300 mesh), bags	20.00@	30.00
Marshall, N. C.:		
Crude	4.00@	8.00
Ground (20-50 mesh), bags extra	6.50@	8.50
Ground (150-200 mesh), bags	8.00@	12.00
Natural Bridge, N. Y.:		
Ground talc (300-325 mesh), bags		13.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 68-72%	4.50@	5.00
Mt. Pleasant, Tenn.—B.P.L. 65%	6.50@	7.00
75% B.P.L. (for furnace use)	6.00@	6.50
75% hand mined		6.50
75% (free of fines for furnace use)	6.50@	6.75
75% max. 5½% I and A	6.50@	7.00
78% max. 4½% I and A		8.00
Tennessee—F. O. B. mines, gross ton, unground Tenn. brown rock, 72% min. B.P.L.		5.50
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	7.00@	8.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12, 24x14	10.20	10.00	8.10	7.80
22x12	10.80	10.00	8.40	8.75
22x11	10.80	10.50	8.40	8.75
20x12	12.60	10.50	8.70	8.75
20x10, 18x10, 18x9, 18x12	12.60	11.00	8.70	8.75
16x10, 16x9, 16x8, 16x12	12.60	11.00	8.40	8.75
14x10	11.10	11.00	8.10	7.80
14x8	11.10	10.50	8.10	7.80
14x7 to 12x6	9.30	10.50	7.50	7.80
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Ground Rock
(2000 lb.)

Centerville, Tenn.—B.P.L. 65%		7.00
Gordonsburg, Tenn.—B.P.L. 68-72%	4.00@	5.00
Mt. Pleasant, Tenn. — B.P.L. 65% 95% thru 100 mesh		7.00
13% phosphorus, 95% thru 80 mesh		5.75
Twomey, Tenn.—B.P.L., 65%	7.00@	8.00

Florida Phosphate
(Raw Land Pebble)
Per Ton

Florida—F. O. B. mines, gross ton, 68/66% B.P.L., Basis 68%	2.50
70% min, B.P.L., Basis 70%	2.75
72% min. B.P.L., Basis 72%	3.00
75/74% B.P.L., Basis 75%	4.00

Fluorspar

Fluorspar, 85% and over calcium fluoride, not over 5% silica, per net ton, f.o.b. Illinois and Kentucky mines	18.50
Fluorspar, foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Philadelphia, duty paid, per net ton	18.00
Fluorspar, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, per net ton, f.o.b. Illinois and Kentucky mines	32.50
Fluorspar, acid lump, 98% plus calcium fluoride, not over 1% silica, per net ton, f.o.b. Illinois and Kentucky mines	35.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Barton, Wis., f.o.b. cars		10.50
Brandon, Vt.‡—English cream	9.00	9.00
English pink	9.00	9.00
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Crown Point, N. Y. — Mica Spar		8.00@10.00
Easton, Penn., and Phillipsburg, N. J.— Green		5.00@ 7.00
Haddam, Conn. — Felstone buff	15.00	15.00
Harrisonburg, Va.—Blk marble (crushed, in bags	†12.50	†12.50
Ingomar, Ohio (in bags)		5.00@20.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.‡—Middlebury white	9.00	9.00
Milwaukee, Wis.		14.00@34.00
Newark, N. J.—Roofing granules		7.50
New York, N. Y.—Red and yellow Verona		32.00
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Stockton, Cal. — "Natrock" roofing grits		12.00
Tuckahoe, N. Y.		12.00
Villa Grove, Colo.		13.00
Wauwatosa, Wis.		16.00@45.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00

†C.L. Less than C. L., 15.50.
‡C.L. lots, for L.C.L. add 3.50 per ton. Add 2.00 per ton for bags.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@35.00
Baltimore, Md. (Del. according to quantity)	16.00@16.50	22.00@50.00
Ensley, Ala. ("Slagtex")	12.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Milwaukee, Wis.	14.00	30.00@42.00
Omaha, Neb.	18.00	30.00@40.00
Philadelphia, Penn.	15.25	21.50
Portland, Ore.	19.00	25.00@45.00
Prairie du Chien, Wis.	14.00	25.00@32.00
Rapid City, S. D.	18.00	25.00@45.00
Watertown, N. Y.	18.00@21.00	35.00@37.50
Wauwatosa, Wis.	14.00	20.00@42.00
Winnipeg, Man.	14.00	22.00

Sand-Lime Brick

Prices given per 1000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	14.00@15.50
Brighton, N. Y.	16.75
Dayton, Ohio	12.50@13.50
Farmington, Conn.	14.00
Grand Rapids, Mich.	12.00
Hartford, Conn.	14.00
Jackson, Mich.	13.00
Lancaster, N. Y.	13.00
Michigan City, Ind.	12.00
Milwaukee. Wis.	13.00
Portage, Wis.	15.00
Rochester, N. Y. (del. on job)	19.75
Saginaw, Mich.	13.00
San Antonio, Texas	13.00@13.50
Syracuse, N. Y.	*20.00
Terra Cotta, D. C.	13.50
Wilkinson, Fla.—White	13.00
Buff	17.00

*Mill price, $22.00 delivered.

Gray Klinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrated, per ton Finishing	Common
Atlanta, Ga.	22.50	14.00
Baltimore, Md.	24.25	17.85
Boston, Mass.	20.00	14.00@15.00
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	18.00
Dallas, Tex.	20.00	——
Denver, Colo.	24.00	——
Detroit, Mich.	15.50	15.50
Kansas City, Mo.	19.50	18.50
Los Angeles, Calif.	....	18.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	....	21.00
New Orleans, La.	24.00	16.00
New York, N. Y.	18.20	12.00@13.10
Philadelphia, Penn.	23.00	16.00
St. Louis, Mo.	24.00	20.00
San Francisco, Calif.	....	22.00
Seattle, Wash. (paper sacks)	24.00	——

Portland Cement

Prices per bag and per bbl. without bags net in carload lots.

	Per Bag	Per Bbl.
Boston, Mass.	....	2.63
Buffalo, N. Y.	....	2.48
Cedar Rapids, Iowa	....	2.44
Cincinnati, Ohio	....	2.47
Cleveland, Ohio	....	2.39
Chicago, Ill.	....	2.20
Columbus, Ohio	....	2.44
Dallas, Texas	.53¾	2.15
Davenport, Iowa	....	2.39
Dayton, Ohio	....	2.48
Denver, Colo.	.63¼	2.55
Detroit, Mich.	....	2.25@2.35
Duluth, Minn.	....	2.19
Indianapolis, Ind.	——	2.41
Kansas City, Mo.	....	2.17@2.47*
Los Angeles, Cal. (less 5c dis.)	.60	2.60
Louisville, Ky.	....	2.45
Memphis, Tenn.	....	2.60
Milwaukee, Wis.	....	2.25@2.35
Minneapolis, Minn.	....	2.42
Montreal, Que.	....	1.90
New York, N. Y.	....	2.25
Omaha, Neb.	....	2.91*
Pittsburgh, Penn.	....	2.19
Pittsburgh, Penn.		2.19
San Francisco, Calif.	.65¼	2.31
St. Louis, Mo.	.57½	2.30
St. Paul, Minn.	....	2.42
Seattle, Wash. (10c bbl. dis.)	....	2.65
Toledo, Ohio	....	2.40

NOTE—Add 40c per bbl. for bags.

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Buffington, Ind.	....	1.95
Concrete, Wash.	....	2.35
Dallas, Texas	.52½	2.50*
Davenport, Calif.	....	2.05
Hannibal, Mo.	....	2.05
Hudson, N. Y.	....	2.05
Leeds, Ala.	....	1.95
Nazareth, Penn.	....	1.95
Northampton, Penn.	....	1.95

*Including sacks at 10c each.

Cement Products

Hawthorne tile, carload lots, f. o. b. plant.

	Cicero, Ill. Per sq.	Ft. Worth, Tex. Per sq.
Silver gray	......	8.00
Red French	9.50	9.00
Green French	11.50	10.00
Red Spanish	10.00	9.00
Green Spanish	12.00	10.00

	Cicero Red	Cicero Green	Ft. Worth Gray	Ft. Worth Red	Ft. Worth Green
Ridges	.25	.35	.25	.25	.30
Hips	.20	.30	.14	.14	.17
Ridge closers	.05	.06	.06	.06	.06
Hip terminals, 3 way	1.25	1.50	1.00	1.00	1.25
Hip starters	.50	.60	.22	.22	.25
Gable finials	1.25	1.50	1.00	1.00	1.25
Gable starters	.20	.30	.14	.14	.16
End bands	.20	.30	....	....	—
Eave closers	.06	.08	.06	.06	.06

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

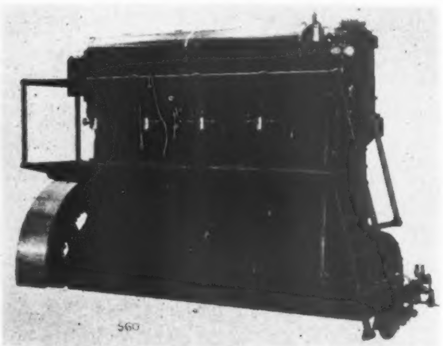
	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36". Wt. 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36". Wt. 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lgths. 6'-10', 1850 lb. Per M Sq. Ft.
Centerville, Iowa	3.00	9.00	12.00	8.00	8.00	8.60	11.00	....	25.80	9.00	....	....	....
Douglas, Ariz.	....	....	7.00	....	16.50	....	19.50	....	....	15.50	....	....	....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	....	26.55	20.00	....	....	....
Gypsum, Ohio‡	3.00	4.00	6.00	9.00	9.00	9.00	18.00	7.00	30.15	20.00	....	20.00	30.00
Hanover, Mont.	....	....	....	11.80	....	....	....	....	....	....	....	....	....
Los Angeles, Calif.	....	....	....	10.90b	....	....	12.30	....	....	....	....	....	....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	....	20.00	30.00
Portland, Colo.	....	....	....	10.00	....	....	....	....	....	....	....	....	....
Sigurd, Utah	....	....	....	....	....	....	....	....	18.00a	....	....	....	....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	....	....	....	——	28.50	....	34.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
*To 3.00; †to 11.00; ‖to 12.00; ‡prices per net ton, sacks extra; (a) to 21.00; (b) sacks, 12c each.

New Machinery and Equipment

Diesel Engine Built in Units from 50 to 400 HP.

THE Foos Type "R" Diesel engine, made by the Foos Gas Engine Co., Springfield, Ohio, is of the vertical type and built in single and multiple cylinder units with ratings of 50 to 400 h.p. It operates on the four-stroke, or, as commonly called, the four-cycle principle. The following is from the manufacturer's description:



Diesel engine built in units of 50 to 400 hp.

The fuel injection system is of the airless type, a common measuring pump serving individual injector pumps, with automatic sprays controlling the admission of the fuel to the combustion space.

The base has deep cross girders joining those at the side which form the seat for support of the base on the foundation, the seats for the main bearing shells being located in these cross girders bringing the crank shaft with its working forces close to the point of support.

The housing is of the conventional box type. The method of securing the cylinder jacket to the housing adds to the rigidity as the deep ribbing gives a continuous girder effect to the upper part of the housing. The main bearings consist of cylindrical bronze shells lined with babbitt. They can be rolled out without lifting the crank shaft.

The connecting rods are of forged steel. The foot is of exceptional width and the marine type crank pin bearings are secured by four bolts. This type of construction allows of large crank pin bearings; also the removal of the piston and rod assembly as the foot of the rod will pass through the cylinder bore.

The piston pin bearing is a solid bronze bushing. The piston is of steel, hardened and ground, and of unusually large size, the diameter being one-half of the cylinder diameter.

The piston pin is securely fastened in its seat. A key is fitted to prevent it from turning and a screw lock to hold it in position but allowing free movement for expansion and construction. An additional safeguard is a spring ring fitted into a groove turned in the piston pin bore and should the screw lock come loose this guard ring would prevent the piston pin working out and scoring the cylinder wall.

The pistons are of the trunk type and are extra long. Six pressure rings are fitted at the top and two wiper rings at the lower end so shaped as to facilitate proper lubrication.

There is a baffle wall cast in the piston to prevent oil vapor from the housing coming in contact with the heated piston crown, coking and then dropping into the base, fouling the lubricating oil.

The cylinder jackets are fitted with removable liners, the jacket carrying all tension strains. The liner is secured rigidly only at the top and is free to expand as its temperature necessitates. The exterior packing ring at the lower end of the liner provides a convenient means of removal of the liner. The outer walls of the cylinder jacket are extended above the top of the liner and the exhaust and inlet ports are placed in this extension. The inlet and exhaust manifolds are secured to the jacket, permitting the removal of cylinder heads without disturbing these manifolds.

The cylinder heads carry dual inlet and exhaust valves in cages. The seats are separate castings. Valves, seats, etc., are interchangeable and the exhaust valve cages are water cooled.

The inlet manifold is so constructed as to form the housing for the cam shaft, bearings and the gears and the individual injector pumps are mounted on the under side of this casting and are removable as a unit. The fuel measuring pump is mounted on the upper half of the cam housing at the front end of the engine.

The plunger is driven by a lever which receives its motion from a cam on the cam shaft. The pump is of the constant stroke type and the amount of fuel delivered per stroke is under control of the governor. A bypass valve is opened during the discharge stroke of the pump, returning the excess fuel to the suction side of the pump.

The lubrication of the cylinders is taken care of by a multiple force feed mechanical lubricator. Oil is fed at two points front and back of the cylinder between the first and second rings from the head end and when the piston is at the bottom of the stroke. Bearing lubrication is provided for by a continuous force feed circulating system.

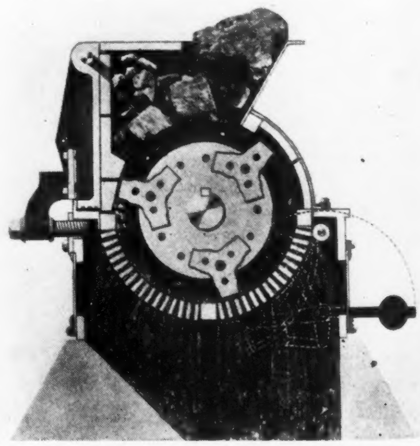
Starting of the engine is accomplished by the use of air at comparatively low pressures. The starting air control valve is mounted in a convenient location at the front of the engine where all controls are grouped.

According to the manufacturers, Coalinga, Calif., heavy crude and Ragland, Ky., crude have been used and satisfactory operation attained with these heavy fuels. Fuel oils covering a wide range have been used, and the fuel consumption at rated load is slightly less than .4 of a pound. Guarantees of .45 at full and three-fourths loads and .5 at half load are given. These guarantees are for any commercial crude or fuel oil produced in the United States.

New Rigid Hammer Crusher for Coal

THE Jeffrey Manufacturing Co., Columbus, Ohio, has brought out a new coal crusher designed to produce a uniformly sized product with less fines than usually accompany such crushing. The product is such as is desired for use with chain grate stokers and for preliminary reduction in pulverized fuel plants. It is called the Jeffrey Rigid Hammer crusher. The manufacturers give the following report of its performance and construction features:

"In a test under actual plant operating conditions a 42x36 Rigid Hammer Crusher



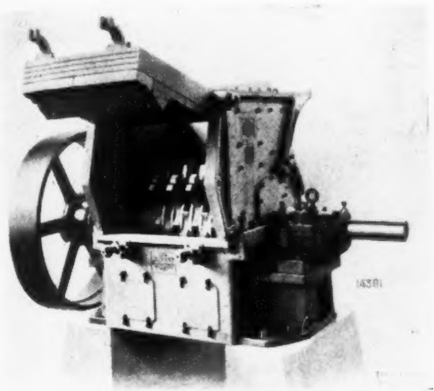
Showing interior arrangement of rigid hammer crusher

consumed only 1/3 h.p. per ton per hour when crushing at the rate of 100 tons per hour. The product from the same test showed:

99% through 3/4-in. mesh screen.
86% through 1/2-in. mesh screen.
67% through 3/8-in. mesh screen.
44% through 1/4-in. mesh screen.
30% through 6 mesh screen.
21% through 10 mesh screen.

11% through 20 mesh screen.

"With an assortment of machine sizes and by adjustments within each size, a complete range of capacities and products from a few tons to hundreds of tons per hour is available. The adjustments are made in the breaker plate or screen bar spacing, also by regulating the speed of the crusher rotor. The same adjustments make it possible to produce large or small pieces with any one of the machine sizes. In the test related above, the screen bars were spaced ¾ in.



The crusher opened

apart and the rotor was running 220 revolutions per minute.

"The construction is heavy throughout and all wearing parts are renewable, including inside frame liners and the breaker plate. The rotor consists of an extra heavy shaft on which steel discs and steels through rods holding the crushing teeth are mounted. The heavy manganese teeth have six wearing corners which are brought into service by simply turning a fresh corner to the work side.

Establish New "Amsco" Foundry at Los Angeles

A NEW foundry for the manufacture of Amsco manganese steel castings has just been placed in operation at Los Angeles, Calif., by the American Manganese Steel Co., Chicago Heights, Ill. This new plant is the most recently established unit of a chain of six foundries now owned by this company, the others being at Chicago Heights, Ill., New Castle, Del., St. Louis, Mo., Denver, Colo., and Oakland, Calif. The organization has facilities for producing about 25,000 tons of manganese steel castings annually and is the largest manufacturer in this specialized field.

The new Los Angeles foundry is of steel construction throughout, with corrugated iron roof and metal sash inside walls. It is thoroughly modern in all respects and equipped with an eye to the economical and efficient production of first class manganese steel castings.

The Chicago office of the American Manganese Steel Co. is at 332 South Michigan avenue.

"Big Facilities and Big Jobs"

THIS is the title of a pictorial story presented in a very attractive book recently published for the Dodge Manufacturing Corporation of Mishawaka, Ind. The object of the book is to acquaint engineers and manufacturers with the Dodge company's manufacturing facilities and its accomplishments in the special machinery field. The book is a series of large spreads visualizing these facilities and some of the equipment produced.

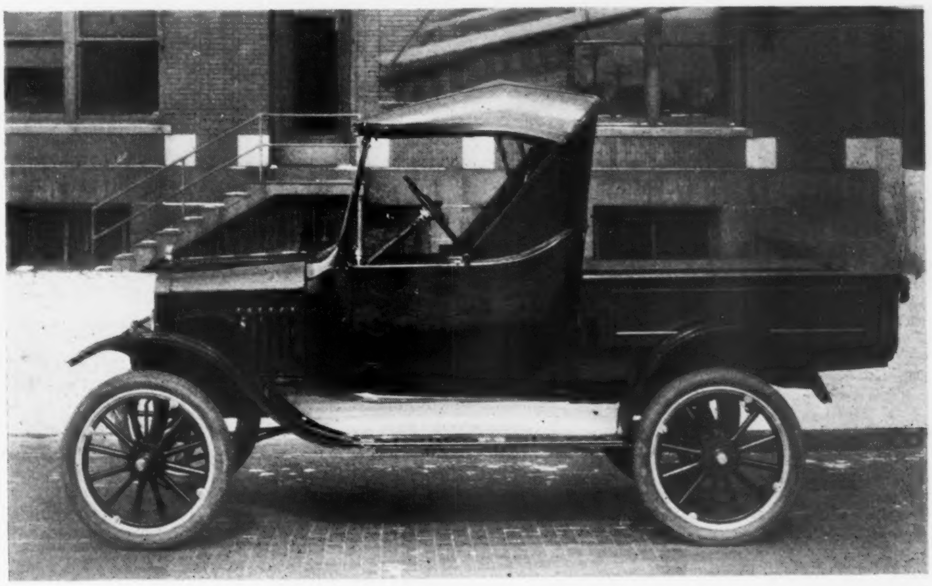
New Hydrator to Be Installed in English Lime Plant

A NEW No. 3 Clyde lime hydrator with weighing hopper and scale, manufactured by H. Miscampbell, Duluth, Minn., has been shipped to B. P. Sexton and Co., Bedford, England. This machine will be installed in the lime plant of Leckhampton Quarries, Ltd.

A New Light Truck

ANNOUNCEMENT is made by the Ford Motor Company of a new light trucking unit. The equipment is a combination of the standard Ford runabout with rear deck replaced by a pick-up body.

This will prove of unusual interest to those who want a light truck for quick delivery of parts and like errands.



New light truck

There is an all-steel body, securely attached to the frame of the chassis, with rear door adjustable chains, side flanges, and steel floor strips with sunken bolt heads. The inside dimensions of the body are 40¾ in. by 56 in. Height from floor to top of flare is 13 in.

Orders are being taken now for immediate delivery. Electric starter and demountable rims are included.

Causes of Dangerous Temperatures in Air Compressors

OCCASIONALLY an air compressor explodes from too high temperatures. The causes of high temperatures in compressors have been recently investigated at the University of California and the results are reported in the *Engineering and Mining Journal-Press* of May 9. The following conclusions drawn from these tests point the way to safe running of air compressors so that explosions may be prevented.

"(1) High temperature does not occur when the compressor is running loaded, unless lubrication or cooling water is lacking; (2) dangerous temperature will not result from throttling the intake unless there is also a failure of cooling water; (3) dangerously high temperatures are caused when a compressor with leaky discharge valves unloads, unless provision is made for the escape of the air from the high-pressure cylinder to the atmosphere, or other steps are taken to prevent the accumulation of heat. The greatest hazard is with a single-stage machine; throttling results in a higher temperature than would be reached under similar conditions in a two-stage machine, on account of inadequate cooling. Throttling a compressor having leaky discharge valves will cause a high temperature unless the cylinder is open to the atmosphere. The operator should use a good grade of lubricating oil and plenty of water, and see that the discharge valves seat properly. When a compressor shows signs of heating, and it is necessary to keep running to finish a shift, the oil and water should first be examined. If the provision of these is satisfactory, the compressor should be prevented from unloading, by setting the unloader valve above the safety valve or by discharging the air by hand when it is in excess of requirements.

News of All the Industry

Incorporations

Independent Sand Co., Ltd., Montreal, Que., registered.

Produits Superieurs de Cement, Ltd., Quebec City, Que., incorporated.

George Trahan, Montreal, Que., registered, to manufacture artificial stone.

Montreal Crushed Stone Co., Ltd., Montreal, Que., granted federal charter.

Colorado Fluorspar Co. of New York, capital increased from $100,000 to $700,000.

Salado Gravel Co., Inc., San Antonio, Texas, increased capital stock from $30,000 to $40,000.

The Western Amiesite Asphalt Co., Wilmington, Del., $12,100,000. (Corporation Trust Co.)

Indiana Portland Cement Co., Indianapolis, Ind., increased capital stock from $2,500,000 to $3,000,000.

Cromwell Quarry Co., Cromwell, Conn., $50,000; Henry Petrofsky, 21 Burr avenue, Middletown, and others.

Concrete Gravel Co., Columbus, Miss., capital stock $30,000; T. W. Townsend, Ira L. Gaston and others.

Glenwood Gravel Co., Little Rock, Ark., has filed articles of dissolution; E. J. Brown, president, and H. M. Evans, secretary.

Olmos Crushed Rock Co., San Antonio, Texas, capital stock $5000; Clifton George, Jr., Mary D. George and Horace King.

Lannon Sand and Gravel Co., Milwaukee, Wis., capital $25,000; Frank Schneider, Henry M. Nugent and S. S. Thompson.

A. C. Lofts and Son and E. E. Newell have engaged in the manufacture of concrete tile and brick at Hood River, Ore.

Rockwood Alabama Stone Co., Nashville, Tenn., capital $101,000; R. T., W. F. and A. D. Creighton, J. S. Dunbar and M. F. Sills.

Livesey Quarry Co., Pueblo, Colo., 25,000 shares with no par value; Charles B. Carlisle, Norbert Zink and W. L. Stone.

U. S. Rock Asphalt Corporation, Wilmington, Del.; $1,500,000, mining and quarrying. (Corporation Trust Co., Jersey City, N. J.)

Beutin-Buehler Co., Dubuque, Iowa, capital $50,000, to deal in sand, with Frank Beutin, president; Frank Buehler, secretary and treasurer.

Kanawha Cement Block Co., Charleston, W. Va., capital $50,000; Anton Paff, Harry E. Penhale, John H. Linn, W. E. R. Byrne and T. F. Cook.

Parker Gravel Co. Shreveport, La., capital stock $100,000; C. A. Parker, president; F. A. Arrington, vice-president, and J. E. Morgan, secretary-treasurer.

Franco Sand and Gravel Co. Schenectady, N. Y., capital $10,000; J. N. and Edward Cohen and A. Franklin. (Attorney, A. J. Nellis, Albany, N. Y.)

Kirkland Sand and Gravel Co., Kirkland, Wash., capital stock $25,000; R. J. McIntyre and G. A. Purdy. (Attorney, C. S. Gleason, Alaska building, Seattle.)

Howes Sand Co., Inc., Springfield, Mass., $100,000; Leroy P. Howes, president; Genevieve A. Hamilton, treasurer, 112 Suffolk street, and Elisha R. Peckham.

Champion Sand and Gravel Co., Ocean City, N. J., capital $25,000; Florence M., Ira B. and Ira S. Champion. (Attorneys, Dalrymple and Campbell, Newark, N. J.)

Alatary Mica Co., New York City, 250 shares at $100 each, 100 shares common no par; A. T. Kraut, J. Dubi and E. H. Taussig. (Attorney, J. Tietelbaum, 305 Broadway.)

Lion Cement Block Co., Inc., Maspeth, Long Island, N. Y., capital $3000; George and Frederick Bauer, 2574 Mymaud place, Middle Village, and Charles Bauer of Howard Beach.

A. B. Fowler Quarries Co., Guernsey, Wyo., capital stock $350,000; to mine limestone and other minerals. Incorporators A. B. Fowler, Beryl C. Beal, O. L. Shedron, Ada M. Fowler and George Ballard.

Silex Stone Co., Nertney building, Ottawa, Ill., capital $20,000. Manufacture and deal in cement, silica, plaster, paints and buildings materials. Incorporators: Edward F. Kellie, Phillip S. McDougall and George A. Thornton.

Kirkfield Crushed Stone, Ltd., Toronto, Ont., capital $50,000; incorporated by G. F. Morse, president, L. Franeschini, C. Johnston and others to manage stone quarries and deal stone. The company has taken over the quarry formerly operated by the Crushed Stone, Ltd., at Kirkfield, Ont., and has established its head office in the Confederation Life building, Toronto.

Quarries

Rock Products Co., Reno, Nev., has purchased the plant of the Granite Manufacturing Co., 209 Utah street, San Francisco, Calif., and now has plants in Reno, San Francisco and Oakland.

Pond Hill Crushed Stone Co., Pond Hill, Tenn., will expend $30,000 on improvements at its plant. Engineers are making surveys for a transmission line to the plant, which will be operated in the future by electrical power.

Dittlinger Lime Co., New Braunfels, Texas, has entered into a contract with the city of San Antonio to furnish crushed limestone and limestone screenings to be used in the construction of the Olmos creek flood retention dam.

Jacksboro Crushed Stone Co., Jacksboro, Texas, has opened general sales offices for the Southwest at Dallas in the Insurance building. Clyde E. Smith, formerly with the Texas Stone Products Co., has assumed duties as general sales manager.

J. DePuy, contractor for the breakwater being constructed near the Corpus Christi, Texas, port site, is having a railroad spur built to a new quarry which he will open at Olga, Texas, to produce riprap to complete the construction.

George B. and R. R. Walton have leased 10 acres of limestone deposit east of Higbee, Mo., which they plan to develop by erecting a crushing plant to produce crushed stone for state highway construction. They are now trying to secure rail connections with the Alton railroad, which is near the location of the proposed plant.

Sand and Gravel

Mahaska Sand and Gravel Co., Harvey, Iowa, has opened an office at Knoxville, Iowa.

Victor Land and Mineral Co., Carson Hill, Calif., is planning to resume operations at its gravel mine.

Greenville Gravel Co., Greenville, Ohio, will move its washing and screening plant at Urbana, Ohio, to develop a 60-acre tract adjoining the 15-acre tract, which it has practically exhausted.

A sand and gravel washing plant has been erected by the city of Greeley, Colo., with a capacity of 200 yd. daily to produce gravel for filter beds at the city water works. A Fordson tractor furnishes the power for the plant.

Alfred C. and Walter C. Steenburg and Harry F. Hazlett have presented a petition to the St. Joseph county, Indiana, board of commissioners for the construction of a railroad spur from the N. Y. C. tracks across the Liberty highway to a site at Ginger Hill near Lakeville, Ind., where they plan to operate a gravel pit.

Lyman-Richey Co., Louisville, Neb., is having additional tracks laid connecting its sand and gravel plant along the Platte river with the Missouri Pacific R. R. The company recently completed the installation of electrical power equipment and is now operating 24 hours per day and employing about 40 men. Elmer Sundstrom is superintendent.

Red Wing Filter Sand Co., Red Wing, Minn., had its filter sand plant damaged to the extent of about $6000 by fire recently. The flames destroyed the upper part of the plant building and a newly built tramway leading to the new pit, which the company is about to develop. The plant's value is placed at $12,000 by F. O. Green, owner and operator, and is covered by $7000 insurance.

Cement Products

L. C. Pitner, Milwaukee, Wis., is reported to have purchased a 5½-acre tract on Canal street on which he will erect a plant to manufacture cinder concrete blocks. The deal was handled through Segnitz and Co., Brumder building.

American Concrete Products Co., Dallas, Texas, has purchased a three-acre factory site in Dallas and will utilize the buildings on it for a plant to manufacture various concrete products, including artificial marble and roofing tile. P. A. Ritter is president of this new company and Claude Ritter, secretary.

Gypsum

United States Gypsum Co., Chicago, has completed its specialty plant at Gypsum, Ohio, and placed it in operation. All the company's specialties, including Oriental stucco, will be manufactured at this plant.

C. F. Detlefsen is reported to have discovered a gypsum deposit on his ranch near Gustine, Merced county, California. The deposit lies 3 ft. below the surface and is about 60% pure. Mr. Detlefsen is said to be negotiating with a Pacific coast concern in order to develop the deposit, producing gypsum for agricultural purposes.

Lime

United States Lime Co., Davenport, Iowa, has recently purchased the plant of the Alden Lime Co. at Fulton Ill., and will begin operation immediately.

Crystal Carbonate Lime Co., Louisiana, Mo., is contemplating enlarging its plant south of Elsbury, Mo. Charles G. Buffum is president of the company and G. E. Lynott, secretary.

Sand-Lime Brick

Lakeland Brick and Tile Manufacturing Co., Lakeland, Fla., is installing two new No. 3 Clyde mixers in its sand-lime brick plant at Galloway, Fla.

Silica Sand

Silica Products Co., Guion, Ark., has begun mining sand by the tunnel method at its glass sand plant.

Phosphate

San Francisco Chemical Co., San Francisco, Calif., is planning to resume the operation of its phosphate mines in the Monpelier (Idaho) canyon. Joseph J. Taylor will be in charge of operations.

U. S. Export Chemical Co., St. Petersburg, Fla., has begun the operation of its phosphate plant at the mouth of the Alafia river in Florida. According to an announcement made by Harry L. Pierce, president of the company, John Pratt, son of Dr. J. H. Pratt, has been selected as chief chemist and is now functioning in that capacity. In the operation of the plant to produce triple super-phosphate, 130 tons of phosphate screenings, 28 tons of phosphate rock and 100 tons of sulphuric acid are used daily. The Dorr system of concentration is being used by the company.

Personals

William Russel, London manager for The Dorr Co., Inc., is in New York City on a short business trip.

Manufacturers

The Morgan Engineering Co., Alliance, Ohio, has issued a circular presenting its new Morgan type "B" electric crane with worm drives and roller bearings.

Ingersoll-Rand Co., New York, is now manufacturing a new rivet set called the "Jackset." This rivet set for pneumatic hammers is made from a steel alloy and is claimed to be exceptionally durable.

W. W. Sly Manufacturing Co., Cleveland, Ohio, has opened a sales office at 215 Security building, 44 Vernon street, Springfield, Mass., in charge of Daniel L. Harris, sales engineer and former assistant sales manager.

Dings Magnetic Separator Co., Milwaukee, Wis., announces that Mr. Heckman, located at 725 Live Stock Exchange building, Kansas City, Mo., will handle the sale of Dings separators in Kansas and western Missouri.

The Austin Co., Cleveland, Ohio, announces the removal of its New York office to larger quarters in the Equitable building, 120 Broadway. The office is in charge of J. K. Gannett and A. D. Engle and D. C. Raymond are his assistants.

Pennsylvania Pump and Compressor Co., Easton, Penn., announces the appointment of Whitman and Brandt, 705 Bona Allen building, Atlanta, Ga., as district representative for the company's line of air compressors and pumps in the Atlanta territory.

L. B. Foster Co., Pittsburgh, Penn., has moved its general offices to its warehouse yards at Carnegie, Penn. The company will retain a mailing office at its former headquarters in the Park building, Pittsburgh, where the president, L. B. Foster, will be located.

The Webster Manufacturing Co., Chicago, announces the opening of a new branch sales office at 811 Magee building, Pittsburgh, Penn. This office will be in charge of E. E. Landahl, who has been associated with the company for the past 13 years.

Taylor - Wharton Iron and Steel Co., High Bridge, N. J., announces that G. R. Lyman, general manager of sales, resigned, effective May 1, and that G. R. Hanks, formerly superintendent of the High Bridge plant, has been appointed assistant to the president with full charge of all sales. Stanley Apgar has been appointed plant superintendent.

Sullivan Machinery Co., Chicago, has established a new branch office at Pottsville, Penn., at 208 West Market street in conjunction with the Pottsville Supply Co., Inc., which has been the local agent for Sullivan equipment for several years. A. K. Owen will continue in charge under the direction of Edward W. Noyes, district manager at Scranton, Penn.

Stephens-Adamson Manufacturing Co., Aurora, Ill., has established an engineering office in San Francisco, Calif., under the management of Chas. E. Bruff, formerly of the mining engineering firm of Bradley, Bruff and LaBarthe, San Francisco. This new office is located at 621 Wells-Fargo Express building, 85 Second street, and will operate in conjunction with the company's Pacific coast factory in serving customers in northern California and Nevada.

Stearns Conveyor Co., Cleveland, Ohio, has opened a new branch office in Kansas City, Mo., at 3233 Roberts street, in charge of R. J. Hanna. The company has also moved its New York branch office into larger quarters at 935 Singer building. The Stearns company has furthermore taken on the general distribution of the Messiter scales. These scales are designed to weigh a moving load while on a conveyor and are said to have proven satisfactory.

Hubbard Steel Foundry Co., East Chicago, Ind., has been making considerable improvements at its plant, which is now equipped to make any steel casting from 1 lb. to 100,000 lb. Work on the new machine shop is progressing satisfactory and when completed in early June the company will be able to render service on any type of rough or finished steel casting. The company has two foundries, one for small quantity and the other for large production work, and specializes in castings for railroads, steel mills, cement mills and crushing plants.

Chain Belt Co., Milwaukee, Wis., announces the opening of a sales office at Minneapolis, Minn., at 614 Builders Exchange building, to be in charge of Fred S. Van Bergen. Mr. Bergen was formerly general manager of the Power Equipment Co., Minneapolis, and is a graduate of the University of Michigan. Besides handling the company's lines of transmission, conveying and elevating machinery, the office will also be the Minneapolis distribution for the products of the W. A. Jones Foundry and Machine Co., Chicago, the Reeves Pulley Co., Columbus, Ind., and the Victor Balata and Textile Belting Co., Chicago. The territory covered by this office will include the states of Minnesota, North and South Dakota and parts of Iowa and Wisconsin. "Rex" concrete mixers and pavers will continue to be stocked and distributed by Wm. H. Ziegler Co. of Minneapolis.

Trade Literature

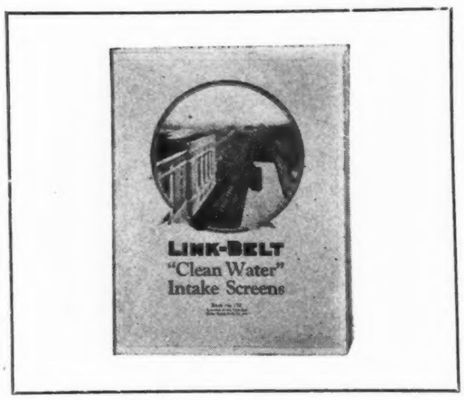
The Dust Recovering and Conveying Co., Cleveland, Ohio, has published a little leaflet illustrating "Dracco" dust collecting installations for sand reclaiming plants and sand blast rooms.

McMyler-Interstate Co., Cleveland, Ohio, has recently issued Bulletin No. 71 describing the construction and use of its Fogarty digging bucket. Specifications are included in the text.

Pennsylvania Pump and Compressor Co., Easton, Penn., has recently issued Bulletin No. 205 describing a close coupled centrifugal pump for brine and water service, in 1-in. and 1¼-in. sizes, for capacities from 10 to 45 gallons per minute.

The Alexander Milburn Co., Baltimore, Md., has recently issued two small booklets, one describing the company's line of portable carbide lights for night operations and the other Milburne welding and cutting apparatus.

Link-Belt Co., Chicago, is issuing a new book, No. 752, descriptive of "Clean Water" intake screens. The forepart of the book is given to a brief description of the general construction of Link-Belt screens and is followed by a number of views of various installations.



Link-Belt book on intake screens

E. J. Longyear Co., Minneapolis, Minn., has recently issued Catalog No. 7 describing and illustrating its diamond core drills and supplies. A short treatise is given in the text on diamond drilling and the general uses of these drills defined. Complete specifications of the drills and supplies are given.

Austin-Western Road Machinery Co., Chicago, has published its 1925 general catalog. During the past year a number of changes were made in the Austin-Western line, some of which were the addition of leaning wheel and motor graders, portable conveyors and four-cylinder motor rollers. The numerous products of the company are well described and illustrated in this 95-page catalog.

Steere Engineering Co., Detroit, Mich., has issued Bulletin No. 41 entitled "Water Versus Steam for Water Gas Making." It treats the so-called Backrun process of manufacturing water gas as introduced in the company Catalog No. 39.

Raymond Bros. Impact Pulverizer Co., Chicago, has issued catalog No. 17, giving descriptions of its various grinding, pulverizing and separating machinery. The catalog is attractive, lucidly written and well illustrated.

Production of Bauxite in the United States in 1924

THE PRODUCTION of bauxite in the United States in 1924 was 346,553 long tons, valued at $2,131,908, a decrease of 34 per cent in quantity and 32 per cent in value as compared with the domestic production in 1923, according to a statement issued by the Department of the Interior, prepared by James M. Hill, of the Geological Survey.

BAUXITE PRODUCED IN THE UNITED STATES IN 1923 AND 1924, IN LONG TONS

Year	Domestic production	Imports	Exports*
1923	522,690	119,020	78,560
1924	346,553	201,974	77,065

*Largely bauxite concentrates.

DOMESTIC BAUXITE SOLD BY PRODUCERS TO INDUSTRIES IN 1923 AND 1924, IN LONG TONS

Year	Aluminum	Chemicals	Abrasives, refractories and Cement	Total
1923	380,520	68,870	73,300	522,690
1924	225,774	53,859	66,920	346,553

The production of bauxite in the Arkansas field was 326,616 long tons in 1924, a decrease of 167,264 tons as compared with 1923. The eastern field decreased its output over 8000 tons, the production in 1924 being 19,937 tons from Georgia and Tennessee. No bauxite was produced in Alabama in 1924. The imports of bauxite in 1924 were 201,974 tons, an increase of about 70% as compared with 1923, most of which came from the Guianas, South America, though some French and Dalmatian bauxite was received.

Pacific Coast Gypsum Company's Plant Sold for Debt

THE Pacific Coast Gypsum Co.'s plant at Tacoma, Wash., was sold at sheriff's sale recently. E. M. Hayden, attorney for the bondholders, S. A. Perkins, Chester Thorne and A. Vaeth, bidding in the plant at $100,000, the amount of the outstanding indebtedness.

The plant has not been in operation for a year, and will not be operated again in its present status, it is understood.

The Bank of California obtained a judgment some time ago in court and the sheriff's auction was a result of that move.—*Tacoma (Wash.) News-Tribune.*

Asbestos Merger Rumored

REPORTS from Montreal indicate that negotiations for a general merger involving the whole asbestos industry are approaching completion and that the terms offered by Dillon, Read & Co. will furnish the basis of the transaction. The merger will embrace the Asbestos Corporation of Canada, the Maple Leaf Co., and the Black Lake Asbestos and Chrome Co., Ltd., and is said to involve combined capitalization approaching $10,000,000.—*Chicago Journal of Commerce.*